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Effect of Fabric Liquid Water Transfer Behavior on Human Thermophysiological Responses and Clothing Microclimate during Exercise and Recovery

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Abstract: This paper reports a study on the effects of fabric liquid water transfer behavior on human thermophysiological responses and clothing microclimate. Both cotton and polyester fabrics were treated to have different liquid water transfer properties. With moisture management (MM) treatment, the fabrics can transfer liquid water from inner surface (close to skin) to outer surface (close to surrounding environment) during wearing while keeping skin dry. With reversed moisture management (RMM) treatment, the inner layer of the fabric is water absorbency, liquid water is difficult to be transferred to outer surface. Two sets of garments were made of MM and RMM fabrics for both cotton and polyester respectively. A series of wear trials were conducted by asking human subjects to wear these garments according to a specially designed experimental protocol. The microclimate humidity and temperature, skin temperature and ear canal temperature were recorded. MM cotton garment caused significant lower absolute humidity outside clothing (H_{co}) during exercise and recovery, higher temperature outside clothing (T_{co}), higher mean skin temperature (T_{sk}) and lower ear canal temperature (T_{ear_canal}) during recovery than RMM cotton. Polyester MM garment caused significant higher H_{co} during exercise and higher T_{sk} than RMM polyester. For both cotton and polyester, MM garment is better than RMM garment to reduce heat stress during exercise and recovery in temperature of 30 °C and relative humidity of 30%.

Key Words: [Liquid water transfer](#), [Thermophysiological responses](#), [Ear canal](#)

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