

## INTISARI

Pakaian dapat menentukan hambatan panas dan sarana transfer kelembaban antara kulit dengan lingkungan. Pakaian yang baik adalah pakaian yang dapat menghasilkan *minimum body heat storage*. Penelitian ini bertujuan untuk mengetahui pengaruh tingkat keketatan dan bahan pakaian terhadap keseimbangan termal tubuh di lingkungan panas dan lembab (34°C, 80%RH).

Responden penelitian ini adalah 9 orang wanita. Responden melakukan aktivitas fisik berupa jalan di atas *treadmill* dengan beban kerja rata – rata 70%HRmax atau setara dengan 4.5km/h. Penelitian terdiri dari tiga fase yaitu 10menit *baseline*, 30menit *exercise*, dan 20menit *recovery*. Setiap responden mengalami empat perlakuan yang berbeda yaitu kondisi saat menggunakan pakaian panjang tertutup berbahan *polyester* ketat, *polyester* longgar, katun ketat, dan katun longgar. Data yang diukur adalah temperatur kulit (Tsk), temperatur timpani (Tty), temperatur pakaian (Tcl), dan denyut jantung (HR). Kemudian dari data tersebut dilakukan perhitungan keseimbangan termal yang terdiri dari *Metabolic Heat Production (M-W)*, *Sensible Heat Loss (C+R)*, Konduksi (K), Evaporasi (E), dan *Body Heat Storage (S)*.

Hasil penelitian menunjukkan bahwa faktor tingkat keketatan berpengaruh signifikan pada proses konduksi, faktor bahan pakaian berpengaruh signifikan pada proses evaporasi dan *body heat storage*, serta faktor interaksi tingkat keketatan dan bahan berpengaruh signifikan pada proses konduksi dan *sensible heat loss*. Dari hasil tersebut maka dapat diketahui bahwa penggunaan pakaian berbahan *polyester* menghasilkan *minimum body heat storage*.

**Kata Kunci:** *Polyester fabric, cotton fabric, heat transfer, thermal balance*

## ABSTRACT

*Clothing can determine heat resistance and can be used as a mean of humidity transfer between skin and environment. Clothing is defined good if it produces minimum body heat storage. This study is intended to determine the level of tightness and clothing material to the body's thermal balance after physical activity in hot and humid environment (34°C, 80% RH).*

*Respondents of this study were 9 women. The respondents performed physical activity in the form of walking on treadmills with an average work load of 70% HRmax of overall respondents or equal to 4.5km/h. The study consisted of three phases, which are 10 minutes of baseline phase, 30 minutes of exercise phase, and 20 minutes of recovery phase. While wearing long body-covering clothing, each respondent was given four different treatments, such as a condition when wearing tight polyester clothing, loose polyester clothing, tight cotton clothing, and loose cotton clothing. The data measured in this study include skin temperature ( $T_{sk}$ ), Tympanic temperature ( $T_{ty}$ ), clothing temperature ( $T_{cl}$ ), and heart rate (HR). Then, thermal equilibrium is calculated from the data acquired which consist of Metabolic Heat Production (M-W), Sensible Heat Loss (C + R), Conduction (K), Evaporation (E), and Body Heat Storage (S).*

*The result of this research indicates that the tightness level factor significantly influences the process of conductive heat loss, the clothing material factor significantly influences the evaporation process and body heat storage, and the interaction factor of the material tightness level significantly influences the conduction process and the sensible heat loss. According to the results, it can be seen that the use of polyester clothing produces minimum body heat storage.*

**Keywords:** *Polyester fabric, cotton fabric, heat transfer, thermal balance*