CORE TEMPERATURE IN RELATION TO SKIN TEMPERATURE IN A UNILATERAL TRANSTIBIAL AMPUTEE

Jeremy Farley, CPO/L, BS BMED
The Fillauer Companies, Inc

INTRODUCTION
It has been demonstrated on many occasions that individuals with a lower limb amputation expend more energy during normal walking able bodied counterparts. Current prosthetic technology allows for the encapsulation of the residual limb within a sheath (cotton, pelite, gel) or liner. The residual limb is then placed with a socket, which allows for the attachment of other prosthetic components (pylon, foot, etc). One of the most popular methods of suspending the prosthesis is to use a suspension sleeve (gel, neoprene). All of these items combined; liner, socket, suspension sleeve, create an environment nonconducive to the shedding of heat. While skin temperature has been giving some attention in the past, little effort has been focused on relating the core body temperature with skin temperature in the amputee.

The theory is as follows: individuals with amputations have a higher metabolic cost during walking activities. This higher metabolic cost produces heat in excess of normal. At the same time a portion of the body has been lost through amputation, while simultaneously covering up more of the body with various materials (liners, sleeves), effectively reducing the available surface area for heat loss significantly. This should produce changes in the bodies core temp, both in how quickly heat is gained/shed as well as body temperature during exercise.

METHOD
A single unilateral transtibial amputee was selected for evaluation. Participant performed a walk/run/walk cycle at 20minute intervals. Temperatures (skin and core) were measured at 10minute intervals.

RESULTS
Participant's core temperature (Graph 1) rose from 99.9°F at rest to 100.4°F after 20min of walking. Running caused a further increase in core temperature up to 101.4°F. During the second walking period core temperature settled at 101.6°F and remained there until the end of the experiment. Skin temperature above the suspension sleeve stayed relatively consistent at 90°F. Thigh temperature at the suspension sleeve rose steadily from 91.5°F at rest to 96.5°F at the end of the experiment. Calf temperature also rose from 93.5°F at rest to 97.5°F at the end of the experiment.

DISCUSSION
The initial rise in skin temperature coincides with data found in the literature. The skin temperature above the suspension sleeve also stayed remarkable consistent during the experiment, staying markedly cooler than the skin temperature of the other sites. At the end of the second walk period, there was a sudden increase in skin temperature above the suspension sleeve. It is unknown why the temperature increased so much, so quickly.

CONCLUSION
Core temperature rose to a peak of 101.6°F, which is in the range of risk of heat exhaustion. This peak was reached at the end of the running portion of the experiment. This data was similar to that found in another study, which found a participant with an amputation reached risk temperature sooner and stayed above longer than an able bodied counterpart. This means that, in this experiment, after 40min of exercise the participant was beginning to overwhelm the body’s ability to shed heat. This is important clinically, as individuals with amputations may have to be more aware of signs/symptoms of exercise induced heat exhaustion during sporting activities.

REFERENCES