

# The Effects of Brock Padding on Thermal Heat Balance, Heat Transfer and Perceived Exertion During Exercise\*

## \*Protocol and Results Overview

by John Seifert, Ph.D.  
Human Performance Laboratory  
St. Cloud State University  
and Edmund R. Burke, Ph.D.  
Department of Exercise Science  
University of Colorado at Colorado Springs

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### **Brock vs. Traditional Pads: Overview of Testing Protocol and Results**

#### **Protocol**

Eight athletes, between 18 and 25 years old, suited up for sprint-rest testing simulating a half of a football game in controlled laboratory conditions. Each athlete ran 6 sets of 10, 6-8 -second sprints, with 24 seconds rest between sprints. Subjects rested for 5 minutes between sets. The athletes sprinted at a controlled 10 mph. The treadmill was set at a 12.5% grade. Each subject was tested two times, once with traditional NFL-level padding and a traditional helmet, and once with the same pads, retrofitted with Brock padding, and a retrofitted helmet.

Core and skin temperatures, heart rate, and the rating of perceived exertion were recorded throughout the exercise. Rectal temperature was used as an index of core temperature and skin temperature was monitored at four sites around the body. Body weight was recorded pre- and post-exercise to evaluate sweat loss. The physiological differences in recovery were recorded post-exercise.

#### **Results**

##### **Core Temperature**

- At the end of the sixth sprint set, the mean core temperature for the Brock trials was 101.8°F versus 102°F for the traditional padding.
- The delta change from the end of the first sprint to the end of the sixth sprint was 1.0°F for Brock, versus 1.2°F for traditional padding. The ending delta was 17% lower in the Brock trial than in the traditional padding trial.

These differences may seem inconsequential, but from a physiological perspective, they are huge. Even small changes in body temperature can have a substantial impact upon performance over extended time on the field.

##### **Skin Temperature**

- At the end of the six sprints, the sternum and back temperatures were significantly lower for the Brock pads. While the data for the thigh and temple were not statistically different, the Brock temperatures were lower.
- At the end of the 30 minutes of recovery, all four temperatures were dramatically lower in the Brock pads.

Brock padding promotes lower skin temperatures, most likely due to the ability of the padding to allow for evaporative and convective cooling of the athlete. Lower skin and core temperatures lead to dramatically less heat storage by the body, and consequently less stress on the body.

### **Heart Rate**

- The mean heart rate at the end of the sixth sprint was 173.5 for the Brock trial, and 177.1 for the traditional padding trial.
- The delta change from the end of the first sprint to the end of the sixth sprint was 6.6 for Brock and 7.3 for the traditional padding. The ending delta was 9.6% lower with the Brock pads.

The lower heart rates in the Brock pads show that the athletes were under less stress while undergoing the same workloads as in the traditional pads.

### **Perceived Exertion**

The Rate of Perceived Exertion (RPE) is a measure of how hard the athlete perceives the work to be. The scale ranges from 6 (easy) to 20 (very, very hard).

- At the end of the sixth sprint set, the mean RPE for athletes in the Brock pads was 13.5. In the traditional padding, it was 16.1.
- The delta change from the end of the first sprint to the end of the sixth sprint was 2.2 for Brock, versus 3.8 for traditional padding. The ending delta was 42% lower in the Brock trial than in the traditional padding trial.
- The perceived exertion on Brock after 6 intervals of exercise was the same as after three intervals with traditional padding.

These are considerable differences. The main point to take away from this is that when an athlete feels better, he or she will perform better. In these tests, the athletes felt much stronger in the Brock pads.

### **Weight Loss**

- At the end of the sixth sprint, the mean body weight change was 2.5 pounds for the Brock trial versus 3.2 pounds for the traditional padding trial.

This represents 22% less sweat loss in the Brock trial. This is evidence that the athletes dehydrated less during the Brock trial. The differences would be much greater in athletes of larger stature playing a full game. In fact, Dr. Seifert extrapolated the test results to an athlete of greater body weight. On a hot day, a 300 pound athlete could lose up to 9 pounds of water weight in one half of a football game wearing traditional padding. Wearing Brock, he would only lose 6.8 pounds.

Dehydration is critically detrimental to athletic performance. It is also a primary cause of heat stress and cramping. The authors of this study, Edmund Burke, Ph.D. and John Seifert, Ph.D., believe these findings showing Brock's ability to

reduce dehydration and heat stress are as at least as significant as the original research showing improved performance, decreased perceived exertion and improved recovery when athletes consumed a sports drink instead of water during prolonged exercise.

### **Recovery**

- Body temperature was 0.4°F lower in the Brock padding at the end of thirty minutes rest, during which time the athletes remained seated in the pads.

This rest period was representative of half-time. The results indicate that the athlete in Brock pads would recover better during rest and would therefore be significantly more fit to play the second half of the game.

### **Conclusion**

All physiological and stress factors measured in these tests comparing Brock and traditional padding show a statistically significant advantage for the athletes while wearing Brock. These advantages include: lower body core temperature and skin temperature; less sweat loss; lower heart rate; improved recovery rate; and less perceived exertion.

This data indicates a substantial competitive advantage and reduced risk for heat stress and cramping for players wearing Brock padding for one-half of a simulated game. The advantage during the second half should be even more pronounced.