



# FINAL REPORT EXECUTIVE SUMMARY

For Public Release

## Part 1 - Summary Details

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**CRDC ID:** RMIT1701

**Project Title:**

Improved Thermal Management Performance of Bedding Systems for effective Recovery in Dynamic Sleep Environments through Cotton-containing Products

**Project Start Date:** 1/01/2017

**Project Completion Date:** 31/12/2017

**Research Program:** 5 (ES2) Driving RD&E impact

## Part 2 – Contact Details

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## Part 4 – Final Report Executive Summary

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*Provide a one-page summary of your research that is not commercial in confidence, and that can be published on the internet. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.*

The complex phenomenon that is human sleep has been studied widely over a number of decades, yet is still not fully understood. As humans, we spend around one third of our lives sleeping. The amount of sleep needed for optimal health in young adults and adult humans is 7–9 hours per night, reducing as we get older (Hirshkowitz et al., 2015). However, for athletes, it is suggested that additional sleep hours are needed for recovery and preparation for competition, meaning that 9–10 hours of predominantly nocturnal sleep is ideal (Bompa and Haff, 2009). However, there is a strong body of evidence that suggests few athletes achieve this optimal amount of sleep. Further, research has shown that non-athletes sleep more than athletes (Walters, 2002) and athletes commonly suffer from poor sleep quality (Samuels, 2009).

It is clear that sleep loss can negatively affect athletic performance and recovery. However, whilst the results of research on the effects of sleep loss on athletic performance vary, particularly in terms of physical output, it is clear that sleep loss reduces cognitive performance, impairs mood, heightens fatigue and decreases vigour. In addition, decision-making is impaired, task performance in speed and accuracy is reduced, and post-exercise recovery is impaired by poor sleep quality. All of these support the premise that optimal sleep patterns promote peak performance outcomes.

There has been a great amount of sleep research that has studied sleep phases, their timing and cycles, with an abundance of evidence in support of the benefits of optimal sleep. Many of these studies have focused on factors that affect sleep time and sleep quality, such as age, psychological conditions, culture and environmental factors.

For example, it is clear that skin temperatures and sweating levels during sleep can significantly affect sleep quality, such as if the skin temperature is too high or too low, or if the rate of skin temperature change is too rapid, and sweating function changes during phases. This implies that stable ambient and/or bedding microclimates would support good sleep patterns. It follows that the thermal properties of bedding, both in steady-state and also in transient ambient temperature conditions, are important for achieving quality sleep. Therefore there is a need to characterize the various sleeping systems for high-quality sleep.

However, there is a lack of research that has studied the sleeping microclimates, which are greatly influenced by the type of sleepwear and bedding that is used, and their effect on sleep quality. This gap in research knowledge of the effect of different types of sleepwear and bedding materials on the sleep microclimates needs to be filled.

Present literature review covers the fundamental elements of human sleep and provides a specific focus on the sleep of athletes. Further, it offers evidence of the benefits that sleep can have on athletic performance and recovery, and how a study on the sleeping micro environments can further develop the current body of sleep research that is seeking to improve the sleep quality of humans.

Finally, the review underpins the aim of this research project, which is to provide initial objective understanding of the influence of various sleepwear and bedding on the sleep microclimates.