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## [Army investigates shelter lighting effects on Soldier thinking, mood](#)

By Jane Benson, NSRDEC Public Affairs  
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A Soldier completes a color discrimination task under light-emitting diode lighting during a recent study at the U.S. Army Natick Soldier Research, Development and Engineering Center. The study is looking at the links between lighting and cognitive performance. Courtesy photo

NATICK, Mass. - A light bulb drawn over someone's head usually symbolizes an idea – but could the type of light bulb, or type of lighting, actually affect how well someone is able to think?

Researchers at the Natick Soldier Research, Development and Engineering Center are investigating the effects of different types of lighting in military shelters on Soldiers. Specifically, members of NSRDEC's Cognitive Science Team are examining the effect of lighting on mood, or affective state, as well as visual acuity, cognitive alertness/awareness and the ability to perform tasks.

The team is investigating two types of lighting – traditional fluorescent lighting and newer light-emitting diodes technologies. The lighting is being studied at varying color temperatures ranging from low color temperatures of yellow/red to high color temperatures of blue/white.

Twenty-four human research volunteers, Soldiers between the ages of 18 to 31, participated in the study, which took place at NSRDEC over the course of five consecutive days.

“The ultimate aim of the project is to develop efficient spaces that promote well being,” said Breanne Hawes, member of the Cognitive Science Team and lead researcher on this particular project. “We were thinking of Soldiers in tents doing mission planning. This is where they set up their maps and have their meetings in shelters, and we wanted to see how the lighting would affect that especially, among other things.”

Caroline Mahoney, leader of the Cognitive Science Team, explained that one of the goals of the team, which does basic and applied research to monitor, predict and enhance cognitive performance, is to help shape technology and material development. On this study, the Cognitive Science Team worked with the Shelters Team and the Special Projects Team.

“This (study) was about helping material/product developers and designers make decisions about the technology,” Hawes said. “We were trying to analyze different lighting systems. Currently, all the tents use fluorescent lighting and (the Shelters Team and the Special Projects Team members) were trying to analyze three LED systems, which are newer lighting technologies. They were analyzing them based on technological differences, such as how long they last and how easy they are to set up. So the goal for our project was to tie in how (the lighting choice) is actually affecting the people sitting under the lighting, how is it affecting the Soldiers.”

“The goal of the Cognitive Science Team is to enhance the Soldier's capability and survivability within the context that they operate,” Mahoney said. “So we strive to have a really good understanding of their context – whether it is stress, physical fatigue, or a new technology that they need to use and manipulate. How do those things affect their ability to maintain awareness of their situation and their ability to make timely and correct decisions? Ultimately, we want to provide information to predict a Soldier's abilities in a given context, keep them safe and optimize performance.”

“There is a ton of past research on what lighting can do to humans,” Hawes said. “It can affect how sleepy you are, your sleeping patterns, or how productive you are. But this has rarely been studied as a military application.”

LED lighting uses less energy than fluorescent lighting and has a longer lifetime, but its use in room lighting is still relatively more expensive than traditional lighting.

“This study is important because it is the first study that has considered the tradeoff between the differences in cost between the lighting technologies and the impact of the lighting on Soldier mood and performance,” Mahoney said.

Compared with florescent lighting, the NSRDEC researchers concluded that LED lighting in a work environment seems to foster positive mood, increased alertness, and faster performance on visual perceptual and cognitive tasks. Soldiers working in fluorescent lighting tended to feel less alert, more fatigued and more depressed over time. Under fluorescent lighting, Soldiers showed slower response times on cognitive tasks measuring spatial and verbal memory.

This data has both military and industrial applications and could help designers to create work spaces where lighting improves concentration and mood.

“The results from this study impact the bigger picture because these LED lights are a very new technology,” Hawes said. “There hasn’t been a lot of human-centered research on them yet. There have been many previous studies on how lighting affects sleepiness and other measures, but those studies have focused on fluorescent lighting. This study adds to the research on LED lights.

This approach to research is something I’m really interested in – really keeping the human element in mind,” Hawes said. “Really thinking it through and keeping in mind how it is going to affect the end user: the Soldier. It’s important to consider how we can make things so they can perform their best and help ensure their well-being.”