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Slug: ResearchStudentsHein.Manitowoc.Draft1.06122018

## **UW-Manitowoc Students ‘Do Science’ by Conducting Active Research**

UW-Manitowoc nursing students [Jeremy Fessler](#) and [Lauren Salutz](#) participated in research far beyond what first- and second-year college students are exposed to on most campuses. Every course in the UW-Manitowoc biology department—including Professor Richard G. Hein’s human anatomy and physiology course—incorporates active research on a level usually reserved for upper-level students at other schools.

“We feel that this high-impact practice is important to all students who are studying science, both majors and non-majors,” Hein said. “Students can’t gain a true understanding of the process of science until they do it through a real-world research project. They learn that science is not a bunch of information that needs to be memorized, but an exciting process for discovering how the natural world works. They actually get to do science.”

The students worked together on “The Effect of Lavender Essential Oil on the Parasympathetic Nervous System Activation,” and presented their team research results at the UW-Manitowoc Undergraduate Research and Creativity Symposium.

### ***Student designed project***

“This experiment was completely designed and conducted by our lab group, and everything within the experiment was approved by the Institutional Review Board,” Salutz said. The IRB ensures human subjects are not harmed during research. “In building this experiment from the ground up, we began by brainstorming topic ideas and ultimately proposed the idea of the effect of lavender essential oil on parasympathetic nervous system activation. Activation of the parasympathetic nervous system involves physiological changes in the body that accompany relaxation, like decreased heart rate, breathing rate, and blood pressure, as well as vasodilation of the blood vessels which results in an increase in peripheral skin temperature.” ”

Prior to conducting the research, Fessler shared his own experience using diffused lavender essential oil in a dementia unit where he works and its noticeable effect in eliminating anxious behaviors. The parasympathetic nervous system is sometimes referred to as the “rest and digest” system. Lavender’s two main chemical components, linalool and linalyl acetate, make it part of the chemical compound group known as the esters, which, in a broad sense, are known for promoting relaxation.

The student team came up with independent, dependent, and controlled variables for the experiment; a hypothesis; and both control and experimental groups for the research.

“Our independent variable was the inhalation of lavender essential oil via aromatherapy, and our dependent variables were the heart rates of our subjects and a mood score obtained from a Profile of Mood States (POMS) examination,” Salutz explained. “We ensured to control variables like the potency and brand of lavender essential oil used for experimentation, the amount of time that the essential oil diffuser was on for, and room setting/lighting/temperature during experimentation. We concluded that our experimental group would involve our subjects who inhaled lavender essential oil via a diffuser, and our control group would consist of the subjects who inhaled only water via a diffuser.”

Experimentation took place with 54 subjects in the nursing lab at UW-Manitowoc, and focused on measurements of heart rate and mood while resting, after experiencing the diffusion and inhalation of either lavender or water, and then a follow-up after a short waiting period. The data was submitted to campus statisticians for additional interpretation. Campus design students collaborated on the research poster presentation.

### ***Significant research results***

“Overall, we found that heart rate, on average, decreased by almost seven beats per minute upon lavender oil inhalation, and increased by about two beats per minute upon just water inhalation. This was statistically significant data,” Salutz said. The POMS mood scores did not show any statistically significant data, as both control and experimental groups showed an improvement in mood from pre- to post-experimentation. “The decrease in heart rate that occurred for participants inhaling lavender, and the lack thereof for those inhaling just water via aromatherapy, further supports the fact that lavender essential oil inhalation activated the parasympathetic branch of the autonomic nervous system.”

“It was very exciting to learn from our statistical evidence that lavender essential oil does indeed help with relaxing the parasympathetic nervous system,” Fessler said, adding that the several months of close collaboration also taught him patience and teamwork. “It was very fascinating to have the evidence support our initial hypothesis.”

Salutz credits the research teamwork with increasing her own confidence and independence. “I learned a lot about ...my own capabilities and how, many times, these capabilities complement those of others, bringing even more value to team efforts,” she said. “These are lessons that will help me pursue my dreams wholeheartedly, knowing that I am capable and those around me are, too. I also know... this is a rare occurrence for people in their first two years of college, so having this experience so early on in my college career is something that will benefit me in my future.”

Hein considers the research a foundational experience in completing both undergraduate and advanced degrees, as well as competing for scholarships and assistantships, and acceptance into competitive academic programs.

“I hope they gain a deeper understanding of the process of science and see it as an exciting and fun way to answer important questions,” he said. “Hopefully, it is a life-changing experience for them.” --Monica M. Walk ###