Background

HNRS 118: “Cognitive Electrophysiology,” a new course added to the Honors Program curriculum Spring 2022, focuses on a methodology that records the electrical signals of the brain called electroencephalography (EEG). PURSUE (Preparing Undergraduates for Research in STEM Using Electrophysiology) created the curriculum to reflect nationwide intercollegiate efforts to engage students in STEM with EEG technology. We have investigated the perceived value of STEM and cognitive neuroscience according to the students in the pilot class of HNRS 118 (HNRS118) and compared the results against data from other 100-level Honors classes (HNRS100s) and those enrolled in PSYC374: Cognitive Neuroscience (PSYCH374).

Presumably, students from the 100-Level Honors courses will not have any course exposure to EEG, while PSYC374 offers a short unit covering the methodology used in neuroscience. If HNRS 118 students demonstrate attitudes towards STEM more like those of students in PSYC374 than students in other non-STEM Honors 100-level classes, then this course could be considered effective at facilitating interest in STEM. This research will foster the development of this course. We plan to compare our findings with those from EEG courses being offered at other institutions associated with PURSUE.

Methods

Survey

We conducted a 10-minute Qualtrics survey. Participants were asked 5 questions regarding their attitudes and level of interest in STEM and 7 questions regarding confidence in, attitudes toward, and interest in Cognitive Neuroscience and EEG (CogEEG) on a scale of 1 to 5 (1 = Strongly Disagree, 5 = Strongly Agree).

- Sample question for STEM: “Having STEM courses as part of my undergraduate degree is an important priority to me.”
- Sample question for CogEEG: “I am confident I understand the basic ideas regarding EEG methodology.”
- Sample question for EEG Competence: “I would like to learn more about EEG methodology.”
- Sample question for CogEEG Competence: “I would like to learn more about cognitive neuroscience.”

Participants were also asked 4 multiple choice questions regarding the EEG methodology and accuracy as reported as a percent.

- Sample question for EEG Competence: “What does EEG (electroencephalography) measure?”

Participants

Participants included students from HNRS 118, PSYCH 374, and various 100-level Honors classes. A total of 50 responses were collected, but due to incomplete surveys and overlapping classes, 39 participants were used in the analysis. 94.9% identified as white, while 5.1% as Asian, 74% identified as female, 14% as male, and 5% did not specify. 82% of survey participants were STEM majors and 18% were non-STEM majors. 15 responses were grouped as PSYCH374, 15 as HNRS118 and 11 as HNRS100s.

Discussion and Future Direction

Students from PSYCH374 have a significantly more positive attitude toward cognitive neuroscience and EEG compared to students in Honors 100 courses other than 118. However, HNRS118 performed best on the EEG competence section of the survey. None of the three groups differed in their attitudes towards STEM. A positive correlation was found between attitudes regarding STEM and cognitive neuroscience, while no correlations were observed between attitudes towards STEM and EEG competence, nor between attitudes about cognitive neuroscience and EEG competence. Results suggest that HNRS 118: Cognitive Electrophysiology was successful at developing EEG competency. Regarding interest in STEM, it is difficult to distinguish.

There was difficulty in gauging how the course influenced attitudes in STEM. This could be addressed in the future by administering both a pre- and post-course survey. We are also interested in comparing our results to that of other PURSUE institutions, all of which are small liberal arts colleges offering similar courses as upper-level pilot classes with prerequisites, whereas HNRS 118 is a lower-level class without prerequisites.

There was a clear skew in favor of STEM interest for the groups of PSYCH374 and HNRS100s, with a slightly less negative skew for the HNRS 118 group. The generally favorable attitude towards STEM makes sense, as 82% of survey participants were Neuroscience or other STEM majors who may have been more inclined to participate in a survey about cognitive neuroscience and STEM. Our results are unlikely to be representative of all honors students due to the disproportionate number of STEM students participating. In the future, the survey will be offered to all honors students to get a better representation. The survey could also separate out different groups of EEG and cognitive neuroscience (such as confidence in knowledge or desire to conduct research) to determine other possible associations.

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