ARTICLE
A Proposal for Undergraduate Students' Inclusion in Brain Awareness Week: Promoting Interest in Curricular Neuroscience Components

Alexandre Martins & Pâmela Billig Mello-Carpes
Physiology Research Group, Federal University of Pampa, Uruguaiana/RS/Brazil.

Brain Awareness Week (BAW) is a global campaign aimed at raising awareness of neuroscience and the progress and benefits of brain research. Our proposal was to include undergraduate physiology students in the organization and presentation of BAW activities. In this sense, we proposed the BAW as a neurophysiology teaching strategy. BAW 2013 occurred between March 11-17, and physiology students in the Nursing, Pharmacy and Physiotherapy programs of our university were involved in the organization of and participation in the activities. To evaluate student perceptions of their participation, a questionnaire was used to establish whether their involvement increased their interest in physiology/neuroscience. Our results indicated that this strategy was successful and increased the students' interest in neuroscience and physiology. In addition a survey of undergraduate and graduate students participating in BAW established their interest in the various activities available. The attention and reaction time workshop and the neuroanatomy workshop were the most popular of the eight activities available.

Key words: education; popularization of science; neurophysiology

The International Brain Awareness Week (BAW) is a global campaign sponsored by the Dana Alliance (DANA), a nonprofit organization committed to the advancement of neuroscience/brain research and public awareness thereof. BAW is held annually in March, when partners around the world celebrate progress in the field through various activities. The purpose of the current project was to include undergraduate physiology students in the organization and presentation of BAW as a means of enriching the neuroscience components of the curriculum and motivating stronger engagement with the content.

MATERIALS AND METHODS

The BAW occurred between March 11-17, 2013 and the activities described herein were carried out at the Federal University of Pampa (UNIPAMPA), Uruguaiana/RS/Brazil. All activities were open to UNIPAMPA's academic community including undergraduate students from Nursing, Pharmacy, Physiotherapy, Veterinary Medicine, Physical Education and Natural Sciences, and graduate students from Biochemistry, Animal Science and Pharmacy Sciences (Table 1). After BAW, an online questionnaire was sent to those students who had attended the events (named group I) eliciting course of study, age and perceptions of the BAW activities attended.

The questionnaire contained the following questions: (1) What is your undergraduate/graduate course? (2) What is your age? (3) Which BAW activities did you participate in? Make a general comment about the positive and negative aspects of them; (4) What is your opinion about BAW as an action for dissemination and popularization of neuroscience? (5) Please, considering your experiences during the BAW, assign a score of 0 to 10 (where 0= no positive experience and 10= high positive experience) to the activities.

In addition to those students of group I who simply attended BAW activities (just mentioned), 124 undergraduate physiology students (22.44 ± 4.94 years; 23.70% male; 76.30% female) enrolled in Nursing, Pharmacy and Physiotherapy programs (group II), agreed to participate in the organization and presentation of the BAW activities (Table 1). The impact of their involvement was established by the use of a paper-based survey requiring the selection of one of the following three options: (1) My BAW involvement increased my interest in physiology and neuroscience; (2) My BAW involvement had no effect on my interest in physiology and neuroscience; (3) I did not have any involvement in BAW activities.

RESULTS

Approximately 300 undergraduate and graduate students constituted group I and participated in different BAW activities. As previously mentioned, after the BAW the participants received a questionnaire by email asking them to evaluate the activities. Thirty-six (36) students responded. They had an average age of 22.75 (± 0.7) years, 58% were females and 42% males. All agreed that BAW activities were important and achieved their goals (i.e., dissemination and popularization of neuroscience).

We also asked the participants what activities they liked most; each of the activities were selected by at least one respondent, with the Attention and Reaction time and Neuroanatomy workshops the most popular (25% and 19.44% respectively; Figure 1). In general the students found the BAW to be a positive experience with an average score of 8.7± 0.99 (0=no positive experience; 10=high positive experience).

When we asked those students of group I, who had attended the activities (as opposed to those who had helped to organize and/or present them) to make a general comment about the quality of activities (positive and

Activity	Proposal	Methodology	Number of Participants
Neuroanatomy Workshop	The aim of this workshop was to address specific aspects of nervous system anatomy, relating them to the functions of the different anatomical regions.	The activity was performed in the Human Anatomy Laboratory, organized by students and taught by a Professor of Neuroanatomy. The students used anatomical parts of NS and work in small groups trying identify each part and its function.	30
Prezi Workshop	Prezi is a tool, freely available online, totally different from the other programs for creating slideshows. It gives the user the freedom to organize content in a visual map, opening the possibility of creating non-linear presentations. This tool has been widely used in scientific circles, for presentations at events. Thus, this workshop was held with the aim to empower its use, important for facilitating scientific communication.	The practical activity was conducted in the university computer lab and taught by a professional from the computational area. The participants used the online version of Prezi and learning while used the program.	30
Attention and Reaction Time Lecture	This lecture aimed to show the relationship between attention and reaction time tasks, involving multiple structures of the nervous system.	The activity was organized by students and taught by a Professor of Neuromechanics. After a brief theoretical explanation, practical activities were performed. Using a software to measure the reaction time (RT) the participants evaluate their RT in different situation, e.g., in simple and dual tasks, with divided attention.	30
Neurophysiology of Learning and Memory Workshop	The goal of this workshop was to understand the classification of memories (types) and the processes involved in the neurophysiology of memory, including acquisition, consolidation, retrieval, extinction, reactivation and reconsolidation.	This activity was organized by students and taught by invited students with experience in learning and memory research. After a theoretical part, memory evaluations were performed using clinical memory tests.	30
Language Lecture	All animals communicate with each other, but only humans speak and write. This is because human language has a specific neurophysiologic basis. This lecture aimed to discuss key points related to this.	The activity was taught by a professional from the speech area. During a dynamic lecture, practical activities related to language functions were done.	30
Physical and Cognitive Activities and its Influence on Central Nervous System (CNS) Functions Workshop	It is known that the practice of regular physical exercise promotes several changes, including cardiorespiratory benefits, increased bone mineral density and decreased risk of chronic degenerative diseases. Also, keeping active may lead to improvements in cognitive function. Recent publications suggest that the cognitive activity can have beneficial effects on CNS functions. The objective of this activity was to discuss the theoretical benefits of physical and cognitive activities in the light of scientific data, as well as to demonstrate various types of beneficial activities that can be performed.	The activity was organized by students and taught by a professor and invited students with experience in research. After discussions based in some authors and publications in the area, the participants were asked to develop, in small groups, physical and cognitive interventions that can benefit the health of the nervous system.	30
Production and Presentation of Posters related to the NS Physiology	This activity promoted undergraduate students to present some aspects of neurophysiology research. The topics chosen by the students were: “Physiology of the senses” (Students of the first Physiology course of Nursing and Physiotherapy); “Mechanisms of action of some medicinal products on the CNS” (Pharmacy students); and, “Relationship between NS and other human body systems” (Students of the second Physiology course of Nursing and Physiotherapy).	This activity was organized and conducted by students of Physiology courses that participated in activity in groups, and each group had its specific period to present the results to the public.	124 students of Physiology courses and the public that was not measured.

Table 1. BAW’s activities realized in Uruguaiana/RS/Brazil and its proposals.

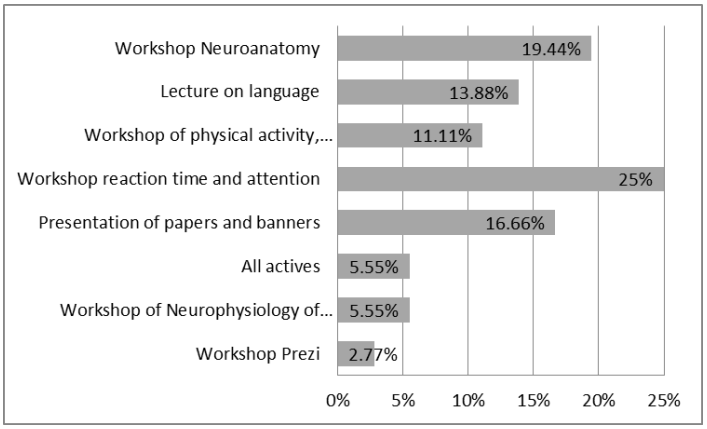

Figure 1. Students' preferred BAW activities (n=36).

negative aspects), some indicated that the workshops and lectures were well presented and the posters were clearly explained by the students during the presentations. They also emphasized that all activities were very interesting and that it was a new thing for the university that encouraged students to become increasingly interested in the topic. The only negative comment was about the limited spaces for lectures, which was related to the space limitation of the available institutional laboratories and classrooms.

Among the physiology students of group II (n=124), who agreed to be involved with the organization of BAW, 90.32% said that this experience increased their interest in physiology and neuroscience, 3.22% said that it did not modify their interest, and 6.45% said they did not participate in the activities (Figure 2).

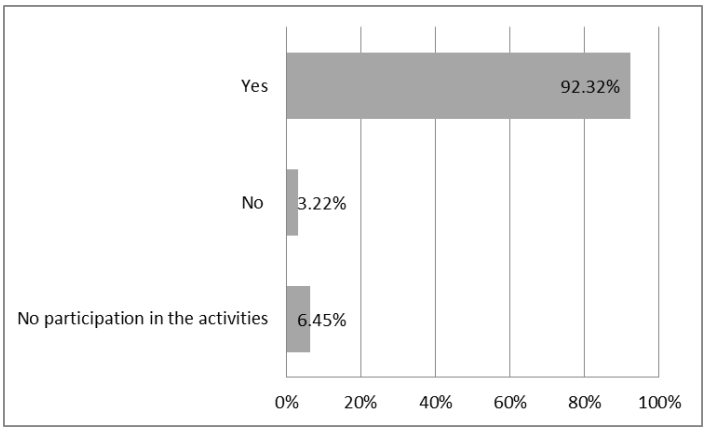

Figure 2. Undergraduate student opinions about the effectiveness of BAW activities in increasing their interest in physiology and neuroscience (n=124).

DISCUSSION

In this study we demonstrate that students found the BAW an effective strategy to promote interest in neuroscience. Although two activities (Reaction time and attention; neuroanatomy workshop) were the most popular, the average level of positive experience was high (8.7 out of a possible 10). All of the activities generated some level of interest. We also verified that most of the physiology students who participated in the organization and running of the activities agreed that their interest in physiology and neuroscience was increased.

Innovation and adaptation of science teaching methods inside and outside the classroom are important since pedagogical proposals can influence student learning (Lin et al., 2012). Armbruster et al. (2009) found that the use of multiple forms of active learning and student-centered pedagogies in an undergraduate biology course resulted in a significant improvement in student engagement and self-reported satisfaction. Armbruster et al. (2009) also found that their approach promoted improvement of student academic performance. Pollack and Korol (2013) used an innovative approach where a haiku, a poem of 17 syllables, was used as a means for students to convey neurobiological concepts in a succinct way. Pollack and Korol (2013) concluded that writing haiku can be an effective way to encourage students to write clearly and concisely, and thus to enhance learning and thinking.

Here, the BAW was used to promote active learning in neurophysiology in an innovative way. This was done through direct student involvement which served to enhance their interest and understanding of research methods in physiology and neuroscience.

In the physiology area, various forms of innovative teaching methodologies have been proposed. One example is the pedagogical process-oriented guided-inquiry learning (POGIL) for anatomy and physiology proposed by Brown (2010). Another is the use of color-coded animations to overcoming misconceptions in neurophysiology learning, proposed by Guy (2012). Both resulted in improvement of student performance in subsequent assessments. Here, we use the BAW as a method of learning neurophysiology in an innovative way: students were challenged, encouraged and motivated to organize activities and carry out the construction of presentations on topics of neurophysiology previously studied in classes, and we can affirm that these activities aroused their curiosity and increased their interest in the course (and in science). Thus, different forms of innovation in the learning process can be valid if they promote the active involvement and motivation of the students.

According to Massarani and Moreira (2004), the popularization of science should include a sufficiently broad collective process, involving research institutions, universities, governments and the actors who weave these elements together: scientists, communicators, journalists, researchers and students. The activities of Uruguaiana's BAW involved researchers, professors and students of our institution, and communicators that assisted in the dissemination of actions, beyond the support of DANA, that sent materials, and of the Brazilian Physiology Society, that provided financial support.

We conclude that students' involvement in BAW can be used as a strategy for improving students' interest in physiology and neuroscience. However, we did not measure whether or not our study actually improved student learning. Our study was also limited by a relatively small number of students that completed responses to the

online evaluation questionnaire (36), although online assessment mechanisms are widely used nowadays (Marden et al., 2013). Because of this, in future BAWs we will work to increase the degree of feedback, possibly by the additional use of printed evaluation forms after each activity.

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Address correspondence to: Dr. Pamela B. Mello-Carpes, Stress, Memory and Behavior Lab, Federal University of Pampa, BR 472, km 592 - PO Box 118 - CEP 97500-970, Uruguaiana-RS-Brazil. Email: pamelacarpes@unipampa.edu.br, phone +55 (55) 96612454