

Application of a Proposed Test for Alzheimer's Disease to Investigate Olfaction in the Human Anatomy Laboratory



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Introduction

Stamps *et al.* (2013) described a simple olfactory test to identify patients in the early stages of Alzheimer's Disease. Previous studies have shown that the olfactory cortex, especially in the left hemisphere, is impaired early in the onset of Alzheimer's Disease and other neurological disorders e.g. Parkinson's disease, resulting in a marked inability to identify familiar odors (such as peanut butter) with the left nostril and a notable asymmetry between odor detection distances between the left and right nostrils.

This report inspired an investigative lab exercise for the Human Anatomy Laboratory. Students hypothesized that :

- odor detection distance would be symmetrical for both nostrils
- male students would have a shorter olfactory detection distance than female students

Materials

Cotton balls (optional) Plastic baggies
 Jar of brand peanut butter (454g) Plastic teaspoons or small paper cups
 Rulers (30 cm) Timers

Methods

Students were grouped into pairs. The test subject was seated with eyes closed and asked to close one nostril with a cotton ball *or* by pressing a finger against the outer wall of the nostril. A 30 cm ruler was placed with the 0 cm end next to the nostril being tested; a heaping teaspoon *or* cup of peanut butter (~ 20 g) was placed at the 36 cm end of the ruler. The teaspoon *or* cup was slowly moved along the ruler toward the nostril (approximately 1 cm per each exhale) until the subject indicated that the odor of peanut butter was detected. The odor detection distance was recorded in cm. Each nostril was tested separately with a 90 second delay between tests. The teaspoon *or* cup with peanut butter was placed in a sealed plastic baggie between trials.

Discussion

Overall for the three trials, the mean odor detection distances for males were: left nostril = 13.14 ± 8.07cm; right nostril = 14.03 ± 7.56 cm and the mean left-right detection difference = -0.89 ± 5.86cm. In females, mean odor detection distance for the left nostril = 14.16 ± 7.84cm, right = 14.17 ± 8.98cm with mean left-right detection difference = -0.01 ± 7.92 . In the college student trials, males had slightly lower mean odor detection distances for both nostrils and exhibited a greater left – right difference than females. In the high school student group, males detected odors at slightly greater detection distances for both nostrils but also showed a greater detection difference between the nostrils than females students. A few individuals showed strong asymmetry between the right and left nostrils with two college female subjects unable to detect the odor of peanut butter at all with the one nostril – right nostril for one ; left nostril for the other student.

Cited References

Stamps, Jennifer J., Linda M. Bartoshuk, and Kenneth M. Heilman. 2013. A brief olfactory test for Alzheimer's disease. *Journal of the Neurological Sciences* 333:19-24.

Acknowledgments

Thank you to the many students in Biol 1001, Biol 2151, and STEM who enthusiastically participated in these experiments and the Pi Alpha Chapter of Tri-Beta who administered the tests at the STEM event.

Results

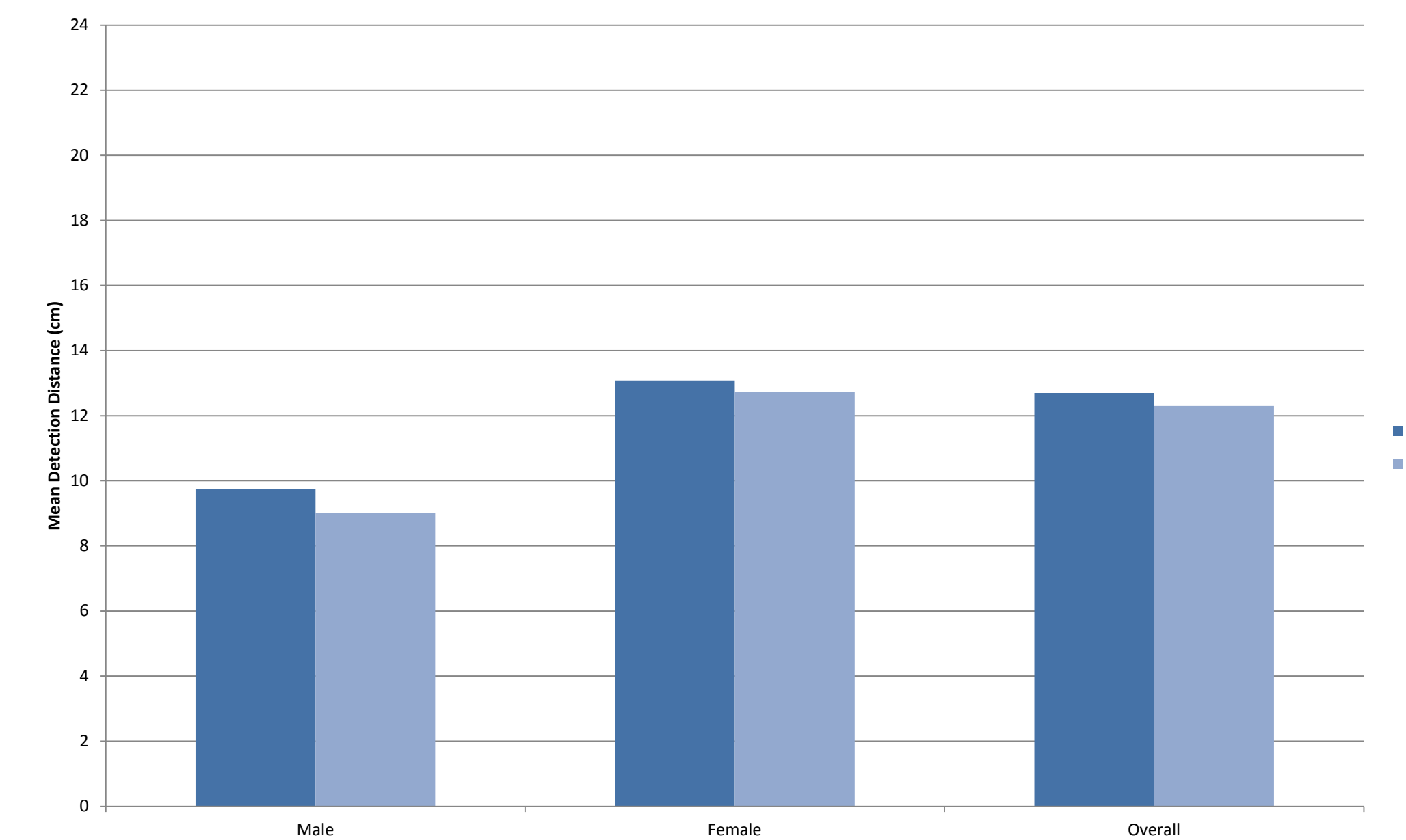
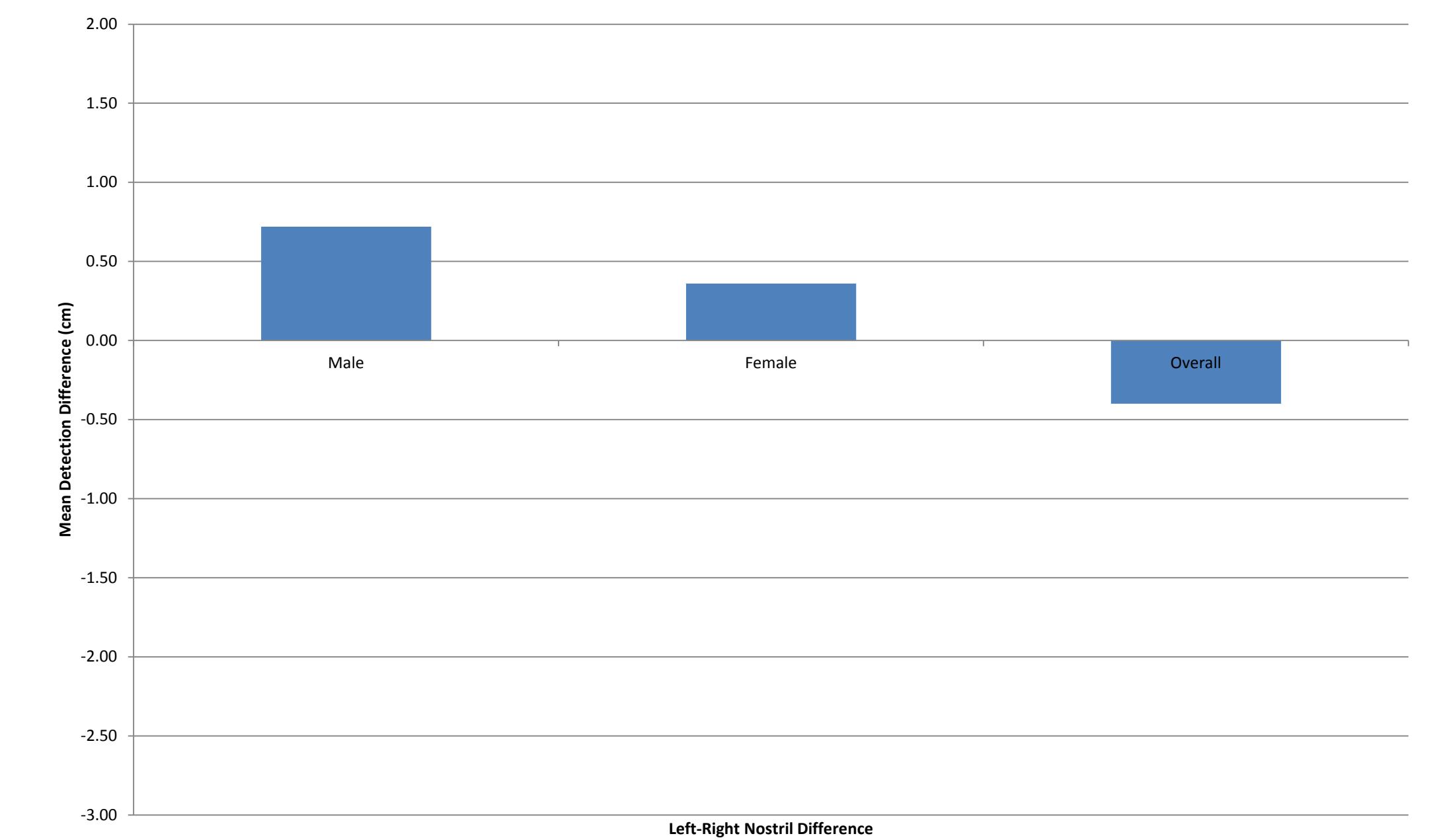


Figure 1a. Mean odor detection distance for the left and right nostrils for male (n=5) and female (n=40) students in BIOL 2151



1b. Mean Left – Right nostril odor detection difference for male and female students .

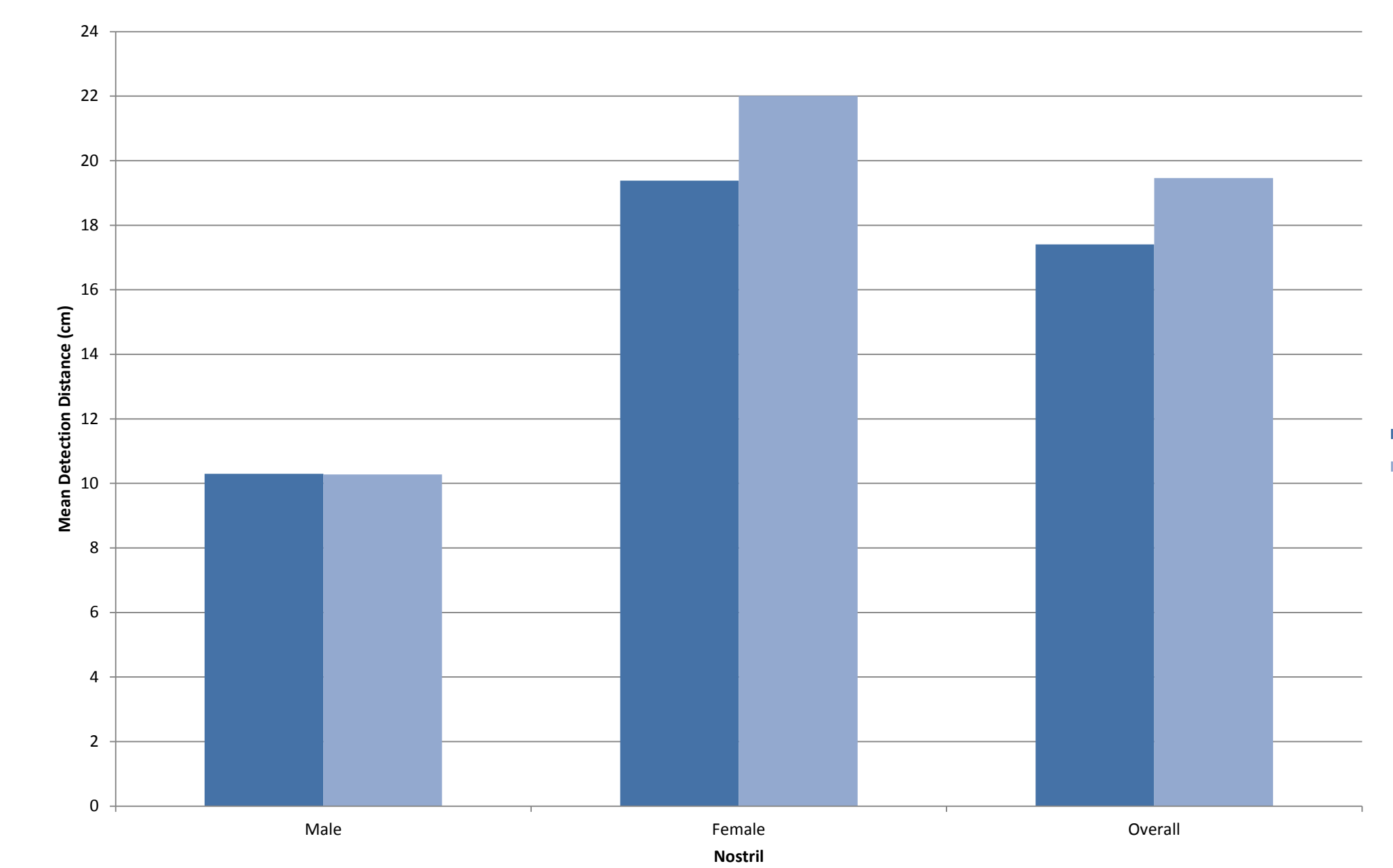
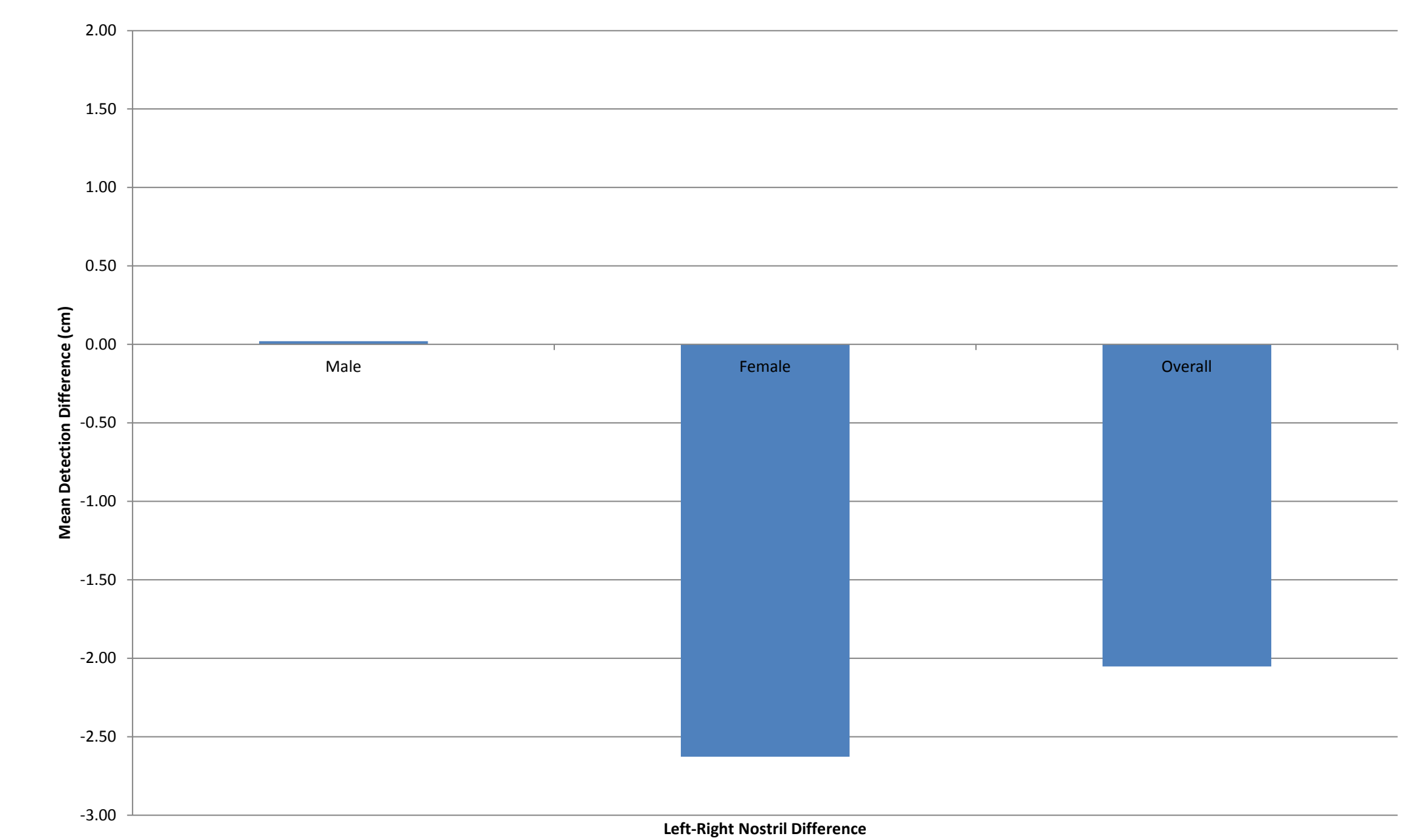


Figure 2a. Mean odor detection distance for the left and right nostrils for male (n=5) and female (n=18) students in BIOL 1001



2b. Mean Left – Right nostril odor detection difference for male and female students .

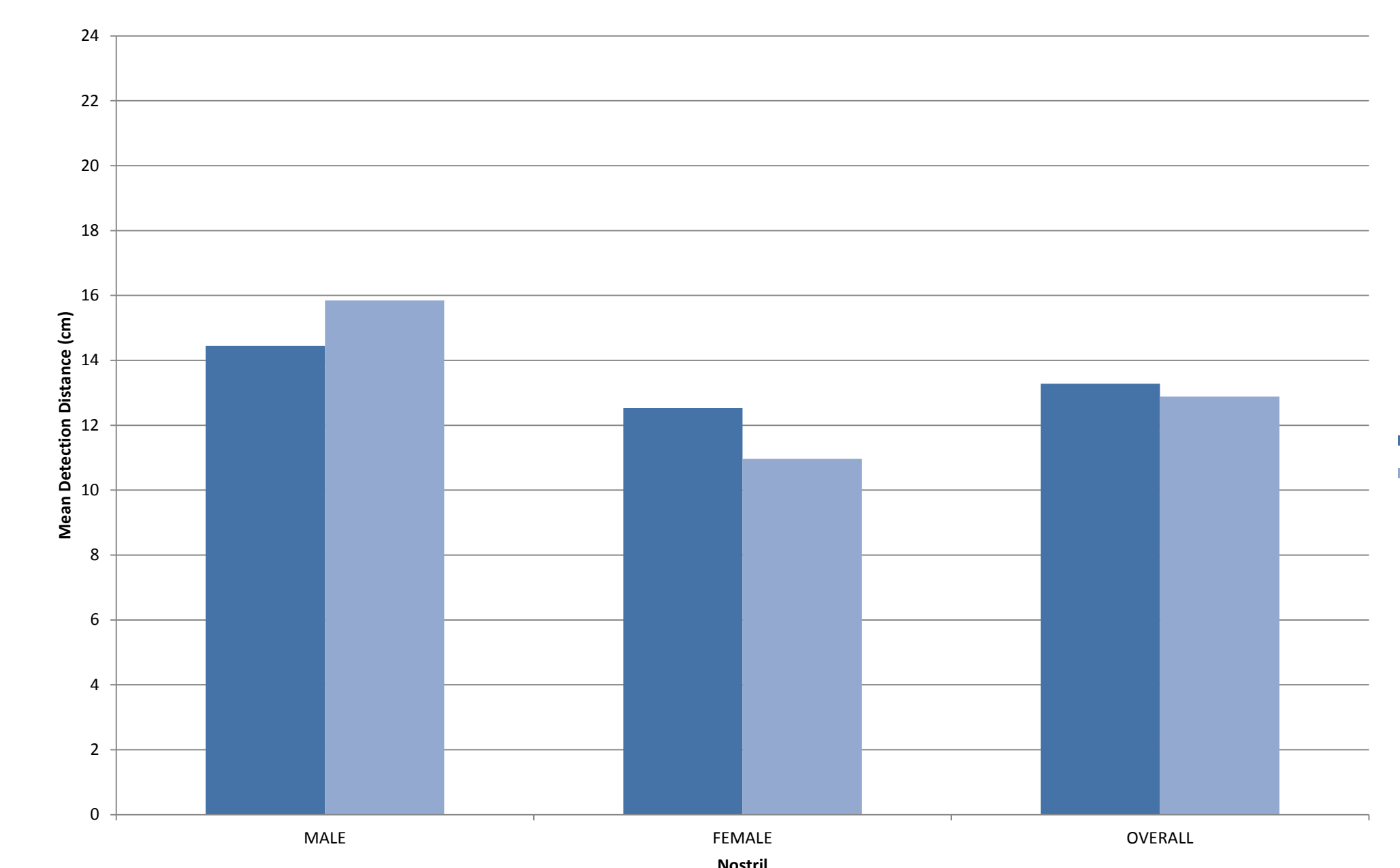
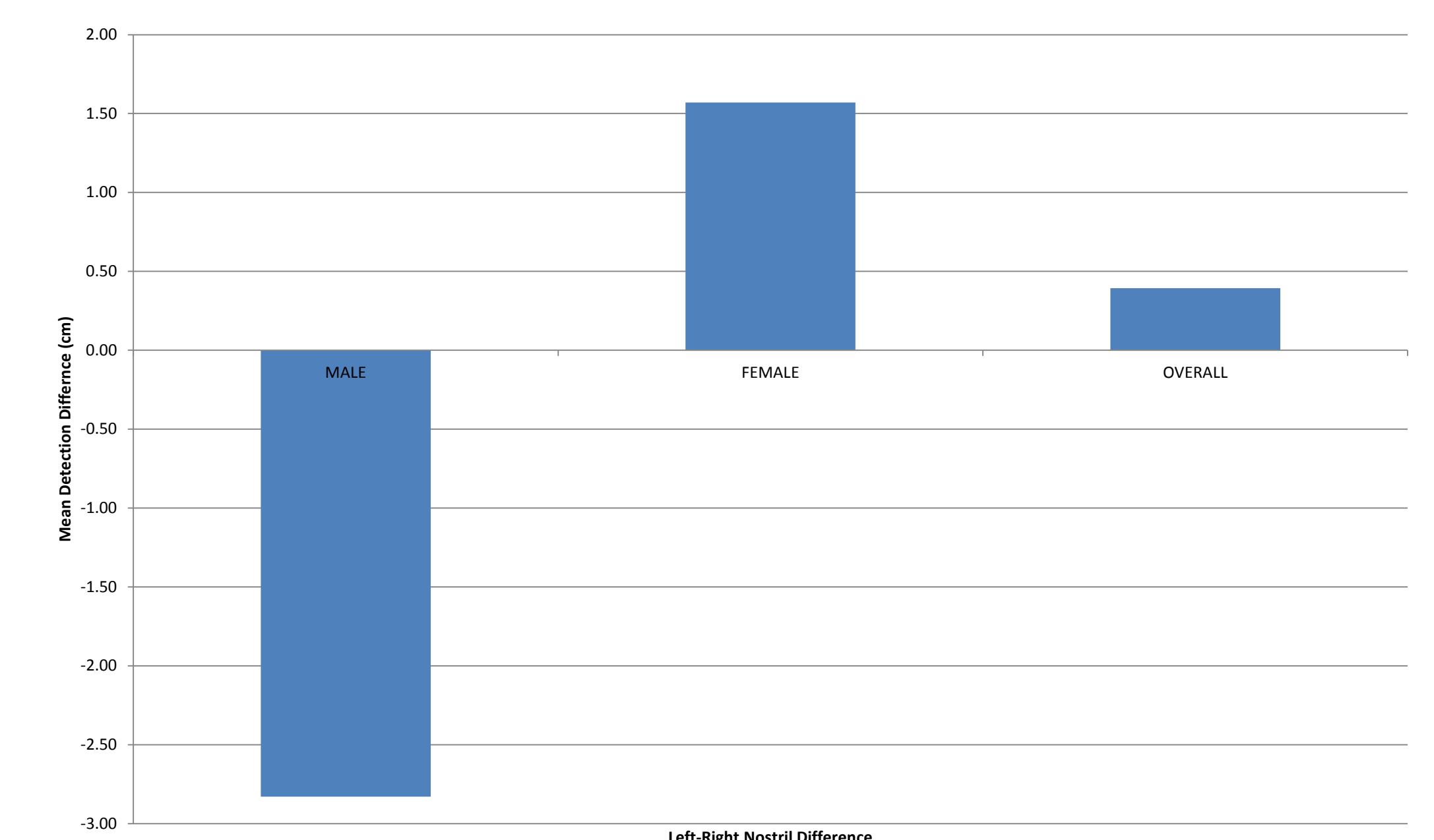


Figure 3a. Mean odor detection distance for the left and right nostrils for male (n=24) and female (n=37) students at STEM.



3b. Mean Left – Right nostril odor detection difference for male and female students.