End of Award Summary Report
Agile Seed Funding
Project: The Sensitive Ear
Researchers: Rachel Bouserhal, Florian Grond, Jeremie Voix, Stephanie Blain-Moraes

The goal of this project is to develop *the sensitive ear,* a wearable intra-aural device aimed to alleviate distress caused by auditory triggers. To do this physiological signals that are linked to distress, such as the heart rate and breathing rate, are monitored and captured from inside the ear using the an advanced intra-aural device. When signs of distress are flagged simultaneously with the onset of a particular sound, the sensitive ear adapts to reduce the level of that sound at the wearer's ear.

The auditory research platform (ARP) developed at CRITIAS, containing an in-ear microphone and an outer-ear microphone, is the platform used to develop the sensitive ear. The first steps in achieving the ultimate goals of this project are to benchmark the data captured using the ARP with an existing platform. The Biomusic from the BIAPT lab at Mcgill is used for this benchmarking. Thus, the money received from the CIRMMT Agile seed funding was used as follows: $950 were used to hire an intern to work on this benchmarking, and $550 was used to for a partial reimbursements of parts bought to adapt the ARP to the applications of the sensitive ear project. These invoices include the components for an ARP 3.1 platform as well as a pair of electret microphone with ultra low-frequency response.

The intern was first in charge of setting up a lab streaming layer (LS) to make simultaneous recordings form multiple devices. Once this was setup, the intern worked on a LabVIEW and MATLAB program to calculate the heartbeat from audio recordings captured inside the occluded ear with the ARP. Once the heartbeat calculation algorithm was achieved, measurements from the Biomusic and the intra-aural device were taken simultaneously and there outputs were compared. Preliminary, data showed promising results comparing heartbeat measurements from the ARP and the Biomusic in quiet conditions with a resting heartbeat. However, with an elevated heartbeat, due to physical activity for example, we found that the algorithm is not capable of properly estimating this elevated heartbeat. Right now the intern is working on configuring the algorithms so they can be better adapted to these changes in heartbeat rates.