Justification for Eligibility of Proposed Research

The primary purpose of this research is to explore the neural processes involved in music perception and imagination in order to develop a music-based brain-computer interface (BCI). This BCI will be able to detect the contents of a participant's imagination using only the recorded electroencephalography (EEG) signal. Such a BCI would allow patients that are unable to communicate behaviourally (minimally conscious, locked-in etc.) to communicate by modulating their brain states. I will also be exploring the relationship between neural processes responsible for the perception and imagination of music. BCIs often require a significant amount of training time in order for a patient to learn to use one properly. This can lead to patient fatigue. To reduce training time and fatigue I will use the information collected during music perception to inform how the music imagination data is understood, as passive listening is unlikely to be as tiring as other training paradigms.

This BCI will be developed using healthy participants who will be tested in the lab on a variety of paradigms that manipulate music perception and imagination. Data will be collected using an EEG system during these experiments. Through careful manipulation of audio characteristics such as rhythm, affect and instrumentation I will determine what aspects of music are the most salient and the most identifiable from EEG data alone.

I will have the benefit of conducting this research at the University of Western Ontario under the supervision of Dr. Adrian M. Owen (NSERC Canada Excellence Research Chair) and Dr. Jessica A. Grahn (NSERC Discovery Grant holder) at the Brain and Mind Institute. The Brain and Mind Institute is one of Canada's leading centres for brain research and this offers the ideal environment for research collaboration. Having the opportunity to pursue my research at this institution will allow me to work with the guidance of leaders in the field.

My research aligns closely with NSERC's goal to advance research in a valuable new area of study. This research explores a fundamental process in humans that will ultimately lead to the development of a medical device to be used by patients with motor deficits that affect their

communication abilities. The research will be conducted on healthy human participants and will allow us to learn about the neural processes involved in music perception and imagination. Given the field of my research, my proposed location of tenure, and the contributions to be made by my findings, my application is most appropriately reviewed by the Natural Sciences and Engineering Research Council of Canada.