**Summary for participants**

There is now strong evidence that the visual cortex responds to a wide variety of non-visual stimuli in people born blind. For instance, studies have shown that congenitally blind subjects activate their occipital cortex in response to auditory, tactile (Braille reading) and odour stimuli. This process is referred to as cross-modal plasticity; the visual cortex that normally processes visual information starts to process other information. Such cross-modal activations are much less common in late blind individuals and are typically not observed in normal sighted individuals. There is further evidence that the occipital cortex of congenitally blind individuals is also involved in cognitive tasks such as memory and language. Finally, the visual cortex in congenitally blind subjects is more active at rest compared to that of normal sighted subjects.

We are investigating the neurochemical basis of cross-modal activity and increased resting-state activity of the visual cortex in congenitally blind subjects. We will test the hypothesis that both phenomena are caused by a reduction in GABA levels in the visual cortex. GABA is the main inhibitory neurotransmitter in the brain, meaning that it blocks activity in the brain. GABA can be measured non-invasively in the living human brain by using a technique called magnetic resonance spectroscopy, or MRS. We will therefore use MRS to measure the release of GABA while you will perform either Braille reading or while you listen to spoken sentences (see below).

What does this all mean practically? You will participate in three scanning sessions, each lasting around 90 minutes, spread out over three different days. In the first scanning session, we will use functional magnetic resonance imaging (fMRI). During these fMRI scans, you will do the same tasks as in the MRS scans, namely reading Braille words or listening to short sentences which are pronounced with a particular emotional tone (e.g. in a surprised, angry, or happy manner). The purpose of the fMRI scans is to determine which brain areas are activated when you do these tasks as we will do the measurement of GABA precisely in these same areas. We will also acquire a resting state fMRI scan during which we will measure brain activity when your brain is doing nothing particularly. During the next two brain imaging sessions that will take place the next two days, we will measure the release of GABA while you perform the same two tasks.

These studies have never been performed before in blind subjects. The results will provide novel insights into the neurochemical underpinning of the increased resting-state activity and cross-modal plasticity of the visual cortex in congenital blindness. This information will ultimately be helpful in predicting the results of novel therapies for vision restoration, e.g. stem cell therapy.

The studies will take place at the center for magnetic resonance imaging at Yale University. This is a world-leading center for brain MRI research. The center also plays a world leading role in magnetic resonance spectroscopy imaging. All expenses related to study participation (travel, local stay….) will be covered by the center for magnetic resonance imaging and a small compensation fee will be given to participants for their time devoted to the project.