

Research Subject Information and Consent Form

Title of study: Physiological and Behavioral Consequences of Brain Stimulation

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INVITATION TO PARTICIPATE

You are invited to participate in a study about the roles of the different brain regions in working memory, attention, and perception. You are invited because you are between the age of 18 and 35 and meet our definition of a neurologically healthy individual.

This study is broken down into separate sub-studies. Approximately 18-24 subjects will be enrolled in each of the sub-studies that we conduct at the University of Wisconsin-Madison. Your participation in any of these sub-studies is voluntary.

WHAT IS THE PURPOSE OF THE STUDY?

The overall goal of the study is to gain a better understanding of how different areas of the brain are used in working memory, attention, and perception. We utilize a combination of three techniques: functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and transcranial magnetic stimulation (TMS) to examine the different areas of the brain. The MRI allows researchers to measure brain activity in response to a visual stimulus. The EEG measures the brain wave patterns using electrodes on the surface your scalp. TMS utilizes a magnetic method to stimulate small areas of the brain.

In this study the three techniques are broken up into different sub-studies that examine how the brain works in different ways. The results of each sub-study may help us to better understand the contribution of specific brain areas to working memory, attention, and perception.

WHAT WILL MY PARTICIPATION INVOLVE?

The next few sections of the consent form will describe the procedures that you will undergo as part of your participation in a sub-study and the risks associated with that sub-study. In some cases, you may be asked to participate in more than one sub-study and each of the sub-studies will be described in detail.

Some of the information may be presented more than once. We do this to make sure that you understand each of the different procedures you are invited to take part in. Please feel free to ask us questions at any time.

The next sections relate to the sub-study you are being asked to participate in:

The following information applies to subjects participating in any sub-study:

ARE THERE ANY BENEFITS?

You will not directly benefit from participating in the study. Society may benefit because information may be obtained regarding brain function in normal individuals.

WILL I BE PAID FOR MY PARTICIPATING IN THE STUDY?

You will be reimbursed for participation at \$10 an hour for administrative and behavioral testing, \$15 an hour for MRI scanning and EEG sessions, and \$20 an hour for TMS sessions. If you decide to leave the study early, you will be paid for the amount of time you spent in the study (rounded to the nearest half hour.)

ARE THERE ANY COSTS?

There are no costs to you associated with participating in this study.

WILL THERE BE COMPENSATION FOR INJURY?

In the event that you are physically injured as a result of participating in this research, emergency care will be available. You will, however, be responsible for the charges for the emergency care. There is no commitment to provide any compensation for research-related injury. You should realize, however, that you have not released this institution from liability for negligence. Please contact the investigator, Dr. Postle, at 608-262-4330, if you are injured or for further information.

IF I DECIDE TO START THE STUDY, CAN I CHANGE MY MIND?

Your decision to participate in this research is entirely voluntary. You may choose not to participate. If you do decide to participate, you may change your mind at any time without any penalty or loss of benefits that you had prior to the study. You will be told of any new and significant findings which may affect your willingness to continue.

Your decision of whether or not to participate in this study will not affect the quality of any medical care you receive from the University of Wisconsin Hospital and Clinics or any relationship you have with the University of Wisconsin-Madison. If you have any relationship with the researchers, your decision to participate or withdraw from this experiment will in no way affect your grades or job evaluation by the researchers in any way.

WILL MY CONFIDENTIALITY BE PROTECTED?

We have strict rules to protect your personal information. We will limit who has access to your name, address, phone number, and other information that can identify you. We will also store this information securely. We may publish and present what we learn from this study, but none of this information will identify you directly without your permission.

WHAT IF I HAVE QUESTIONS?

If you have questions about this research, please contact the study investigator, Bradley R. Postle, at 608-262-4330. If you have any questions about your rights as a research subject or complaints about the research study that you could not resolve with the study team contact UWHC Patient Relations Representative at 608-263-8009.

MAY I PARTICIPATE IN FUTURE EXPERIMENTS IN THIS LABORATORY?

If you would like to be invited to participate in future experiments with this laboratory you can include an email address where you can be reached in the future. This information will be stored on a secure server and will not be linked to any other identifiable information. The information will not be distributed to anyone outside of this laboratory. Electing to be contacted for future recruitment and participation in future studies is voluntary and will not affect your participation in this study.

Contact Email: _____

Authorization to participate in the research study:

I have read the information in this consent form, reviewed any questions, and I voluntarily agree to participate in this study. I have received a copy of this consent form.

Signature of Subject **Date**

Signature of Person Obtaining Consent **Date**

Sub-study U (EEG Training):

WHAT IS THE PURPOSE OF THIS SUB-STUDY?

This sub-study involves EEG. You will perform a behavioral working memory task for different item types while the electrical signal on your scalp is recorded (EEG). The purpose of the study is to observe the before and after effect of practicing the memory tasks by analyzing the electrical activity in your brain (with EEG).

WHAT WILL MY PARTICPATION INVOLVE?

The sub-study will involve seven visits. The first visit includes the pre-training session where you will perform the working memory tasks while EEG is recorded. The pre-training session will last 3.75 hours (2.25 hours of that spent engaging in the tasks and breaks given approximately every 9 minutes). The subsequent 5 visits will each be identical to the first session, except that you will perform the memory tasks without the EEG recording. These 5 visits will take place over the course of a week. The final visit will be identical to the pre-training visit, where you will perform the memory tasks while EEG is recorded. We will also ask you to complete a demographic form at the first study visit. Full descriptions of each intervention are provided below.

The study visits will take place at the same location: The UW Psychology building at 1202 W. Johnson Street, Madison.

Working Memory Task: You will be asked to perform a series of working memory tasks during each of the sessions of the study. The working memory task will take about 3.75 hours in total (2.25 hours of task with breaks every 9 minutes). Below are the descriptions of the seven different working memory tasks that you will perform during each visit of the study:

#1. Digit Span: On each trial, a variable number of digits are presented one after another in the center of the screen. Your job is to remember all the digits in the order they were presented. Between 1 and 12 digits are presented, and you will be prompted to write down the digits you see in order on the sheet, with an emphasis on accuracy.

#2. N-Back: On each trial, you will hear a letter and see a blue square somewhere on the screen. On the one-back trials, you will press the "A" key only if the spoken letter is the same as the one on the previous trial. Additionally, you will press the "L" key only if the square is in the same position as on the previous trial. You will only have a few seconds to respond, and the emphasis is on accuracy. After a variable number of trials, you will be asked to report whether the letter and/or square are the same as those presented two trials back (2-back). This applies for 3-back trials, 4-back trials etc.

#3. ANT: At the beginning of each trial, you will see a cross in the center of the screen. You will focus on the cross. After a period of time, either a single blue arrow head or a group of blue arrow heads appear either above or below the cross. In the single arrow condition, the you will hit the left arrow key as quickly as possible if the arrow is pointing to the left, and you will hit the right arrow key as quickly as possible if the arrow is

pointing to the right. In the group arrow condition, you will hit the left arrow key as quickly as possible if the center arrow is pointing to the left. You will hit the right arrow key as quickly as possible if the center arrow key is pointing to the right. In addition to the arrows, there are either one or two blue asterisks that appear near the cross right before the onset of the arrows. In the single asterisk condition, the arrow target eventually appears in the same position as the asterisk. In the double asterisk condition, the arrow target appears either above or below the cross. The cues help you to respond more quickly.

#4. PIMP: At the beginning of each trial, there is a white cross in the center of the screen. Four circles appear in the corners of the screen. Each circle will contain a number of moving dots. The focus is only on the red/blue circles. After a brief duration, the four circles disappear, and a single white circle with moving dots will appear in the center of the screen. If the dots in the white circle are moving in the same direction as the dots in one of the target circles (red/blue), you should hit the “1” key. If the white dots are moving in a different direction than the ones from the target, you should hit the “2” key. There are six blocks, each lasting about 8 minutes.

#5. OSPAN: At the beginning of each trial, there is a math problem on the screen. The task is to indicate whether or not the answer to the math problem is correct. If the answer is correct, you should hit the left arrow key. If the answer is incorrect, the you should hit the right arrow key. Shortly after, the math problem is replaced with a letter. You should remember this letter. You will receive anywhere between 1 and 7 of these math problems and letter combinations in a row. After a variable number of math problems, you must write down all of the letters that he/she recalls seeing in the previous trials in the order they were presented.

#6. Filtering: On each trial, the you will see a display of colored lines. The display appears, disappears, and reappears. The task is to determine whether the red lines changed position from the first to the second display, focusing only on the red lines. A change in the red line position is indicated by clicking the right arrow key. No change in the red line position is indicated by the left arrow key.

#7. RAPM Pre (post version for post-test): A series of patterns on the screen appear, but a piece of the pattern is missing. Your task is to select the piece that you think best fits the pattern by pressing the corresponding number on the keyboard. You will have 20 minutes to complete as many patterns as possible.

EEG Session:

During the EEG visits (pre and post training), you will be fitted with a “net” containing 64 electrodes. This net will fit snugly onto your head, and the electrodes will record electrical signals generated by your brain. Initially, we will ask you to sit quietly, with your eyes closed while we measure these electrical signals. The set up time for the EEG cap is approximately 45 minutes.

Demographic Form: During the first study visit, you will be asked to complete an optional 5-minute demographic form with information about your age, sex, an ethnicity. The form is collected at the request of many funding agencies, such as the National Institute of Health. The demographic form will not contain any information that can directly identify you and will not be stored with your study data. Whether or not you complete the form will not affect your participation in any sub-study.

ARE THERE ANY RISKS?

EEG Tests:

There is a slight risk of skin irritation from the EEG procedure because of the gel used to adhere the electrodes. This is usually only seen in individuals with very sensitive skin. All of the EEG equipment used in this study is FDA approved.

Breach of Confidentiality:

There is a risk that your information could become known to someone outside of the study team. The study involves the collection of some sensitive information, so a breach of confidentiality could result in harm to your reputation. However, we will do everything we can to protect your information.