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Oswald Social Sciences Honorable Mention: Diaphragmatic Breathing and its Effectiveness in the Management of Motion Sickness

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1. Background:

Motion sickness is an unpleasant physiological state that can be defined along four dimensions: gastrointestinal, central, peripheral, and sopite (Gianaros et al., 2010). Viewing motion sickness as a multidimensional construct accounts for symptoms in all four of these areas. Gastrointestinal symptoms include queasiness, disorientation, vomiting, and stomach discomfort. Central symptoms include feeling faint-like, dizzy, lightheaded, and a sensation of spinning. Peripheral symptoms include feeling clammy, sweaty, and hot/warm. Sopite related symptoms include feeling annoyed, drowsy, fatigued, and uneasy. Gianaros developed the Motion Sickness Questionnaire to establish a reliable method for scoring overall motion sickness with the use of four subscales. Determining the extent of one's motion sickness symptoms is the first step in treating the adverse physiological symptoms.

Although some medications may be beneficial for the management of motion sickness symptoms, many drugs are accompanied by negative side effects. These negative side effects can range from slight dizziness to extreme sedation (Heer & Paloski, 2006). The application of diaphragmatic breathing, a non-pharmacologic method for controlling some of the symptoms, is a positive alternative to drug therapies for motion sickness. The effects of this breathing strategy have been explored by a number of experts and the use of this breathing approach enables one to avoid the negative side effects of medicinal options.

Paul Lehrer is a leading researcher in the area of relaxation training and has performed numerous experiments testing the effects of slow-paced, diaphragmatic breathing for influencing physiologic responses to adverse stimuli. His work shows that a breathing approach can be quite successful in reducing physiologic activation of the sympathetic nervous systems. Therefore, we decided to use his training manual as a template for developing our approach to diaphragmatic breathing (Lehrer et al., 2000). Lehrer found that breathing at a pace of 4 to 7 breaths per minute was most effective for quieting activation and used a moving light on a computer screen to help participants pace their breathing. He also provided participants with direct biofeedback to help them amplify their heart rate variability

Martarelli and colleagues (Martarelli et al., 2009) also studied the effects of diaphragmatic breathing on the reduction of oxidative stress caused by prolonged, intense exercise. They recruited sixteen middle-aged males, who agreed to bicycle for eight hours. Then participants were randomly divided into experimental and control conditions. The experimental group performed diaphragmatic breathing in a quiet room for one hour after exercise, while the control group sat/read in a quiet room for one hour after exercise. Oxidative stress, biological antioxidant potential, (BAP) cortisol, and melatonin were all measured after the one-hour period to assess the effect on the antioxidant defense system. Results showed diaphragmatic breathing reduced oxidative stress more than resting quietly. Results also indicated

that diaphragmatic breathing resulted in higher BAP levels, a significantly lower cortisol level (post-relaxation), and significantly higher melatonin levels when compared to the rest only condition. Overall, it was found that diaphragmatic breathing significantly reduced exercise induced oxidative stress and increased the activity of the antioxidant defense system.

Another study examined the specific role of diaphragmatic breathing on cardiovascular parameters (Byeon et al., 2012). Twenty participants trained in diaphragmatic breathing (experimental group) were compared with twenty participants with no exposure to abdominal-breathing. The experimental group used three different breathing techniques: slow abdominal respiration, slow abdominal respiration with inspiratory pauses, and normal respiration. Byeon describes the inspiratory pauses as “holding breath after full inspiration with the airway opened.” Transthoracic echocardiography was used to measure the participants’ inferior vena cava (IVC) and superior vena cava (SVC) diameter, IVC collapsibility index, SVC minute flow, and respiration time. By examining these measures Byeon was able to determine the effect of diaphragmatic breathing on the circulatory system. The results showed that the diaphragmatic breathing participants’ IVC diameter (min) and IVC collapsibility index to be significantly less than those in the control group. Within the experimental group it was found that the slow abdominal respiration with inspiratory pauses had the highest IVC collapsibility and allows for the most efficient venous flow.

Diaphragmatic breathing training has also been applied to those suffering from Gastroesophageal Reflux Disease (GERD). Persons with GERD often try to better their condition with lifestyle changes that include altered sleeping positions, chewing gum, modified eating patterns, etc; however the benefits of these modifications are relatively unknown (Kaltenback et al., 2006). This study examined the benefits of using diaphragmatic breathing amongst 19 adults suffering from GERD (Eherer et al., 2011). The participants were divided into two groups, one that practiced diaphragmatic breathing for 4 weeks in conjunction with acid-suppressant drugs while the control group only took the drugs. Diaphragmatic breathing was taught through a series of exercises in a standing, sitting, and supine positions. Results after the initial 4-week exposure showed those who practiced the breathing had significantly improved GERD symptoms shown by a Quality of Life score, pH-metry, and drug usage. A follow up analysis was conducted 9 months later and confirmed the initial results.

Cordova (1996) studied the effect of slow diaphragmatic breathing on blood pressure and Autonomic Nervous System (ANS) activity. It has been shown that there is an inverse relationship between ANS activity and pressure pain thresholds. Cordova expanded upon this notion to test the different effects of 5% and 3% end-tidal CO₂. The group of participants in the 5% group was taught abdominal breathing, while the 3% group was trained in thoracic breathing. Thoracic breathing (3% ETCO₂) was shown to increase blood pressure and ANS activity. Although, the 5% ETCO₂ kept ANS activity low, results did not indicate diaphragmatic breathing to have a significant effect on pressure pain threshold.

Another study examined breathing technique and its effects on pain threshold as well. Dr. Zautra and colleagues (2009) used slow-paced breathing as an experimental condition and then evaluated participants' thermal pain thresholds. The thermal pain sensations were administered through a thermoelectric device that produced different levels of heat. Participants consisted of healthy control subjects and age-matched subjects suffering from fibromyalgia syndrome (FM). The participants' pain thresholds were evaluated in four trials consisting of mild and moderate pain stimuli (based on temperature) in conjunction with normal and slow breathing. Slow breathing was defined to be half of the subject's normal breathing rate. Zautra used visual command signals to help participants slow their breathing rate. Overall, the results indicated slow breathing significantly reduced pain and negative affect ratings.

The strategy Dr. Zautra used to provide visual cues for the participants involved a moving oval that indicated to the subjects when to inhale and exhale. We obtained a copy of the protocol Dr. Zautra used in the study and have made modifications that would enable us to incorporate it into the present study in order to evaluate the effects of using their approach to breathing entrainment. We intend to test the effects of a modified diaphragmatic breathing protocol in a seasickness-inducing environment. Based on past studies, we expect diaphragmatic breathing will decrease seasickness symptoms through greater heart rate variability and improved physiological self-regulation. Furthermore, we hope that by creating an accessible training method, controlled diaphragmatic breathing may provide a straightforward means for controlling motion sickness.

2. Objectives:

The objective of our intended research will be to apply slow-diaphragmatic breathing as a self-regulatory strategy on participants and measure its effects on physiological, cognitive, and behavioral responses in a seasickness-inducing environment. The hypotheses for the study are as follows: participants in the diaphragmatic breathing intervention condition, compared to those who are in the unaltered breathing condition, will display greater heart rate variability and reduced respiration rates during exposure to a sea motion virtual reality video. Participants in the diaphragmatic condition will report longer periods of exposure to the sea motion virtual reality video before attaining a moderate level of seasickness as compared with the unaltered breathing condition. Finally, those in the diaphragmatic condition will report being in more control of their physiological status as compared to the unaltered breathing condition during the sea motion virtual reality video.

3. Study Design:

The study will consist of seasickness susceptible male and female undergraduates viewing a seasickness inducing video of ocean swells through

virtual reality goggles. Participants will be pre-screened with the Motion Susceptibility Questionnaire Short Form (MSQS) in the Department of Psychology's PSY 100 screening survey (Golding, 2006). The participants with scores above the mean level for the population on the MSQS will be invited to participate by email. If they agree to participate, they will be scheduled to meet the experimenters at the Behavioral Psychophysiology Laboratory in Kastle Hall. When the participants arrive at the laboratory they will be given an informed consent form to read and sign. They will then be randomly assigned to either the control or experimental condition.

Following this, physiological sensors will be attached to monitoring equipment and a baseline assessment will be taken of several physiological factors. Next, depending on the participant's condition, they will be briefed on diaphragmatic breathing techniques or they will receive an attention control manipulation that involves instructions in being aware of one's surroundings. Each manipulation will be delivered by a pre-recorded audio CD which will be followed by a five minute practice session. All participants will watch a video during the practice session in order to help control their breathing. The videos will consist of an oval that rises and falls at a certain pace (six breaths per minute for the diaphragmatic breathing condition or twelve breaths per minute for the regular breathing condition.) The regular breathing video will include a soft tone that corresponds with the oval to indicate to the participant when to inhale. In the diaphragmatic breathing video there will be two tones; one to indicate inhalation and one to indicate a resting period in between breaths. The auditory tones will also be heard throughout the virtual reality video for both conditions.

Before the virtual reality video begins, the laboratory assistant will remind the participant to pace their breathing with the tones for the duration of the video and in the case of the diaphragmatic breathing condition remind them to breathe using their stomach as previously practiced. Upon exposure to the sea motion virtual reality video, a laboratory assistant in the computer room will take nausea ratings every minute and monitor several physiological measures of the participant. All participants' prior and shortly following exposure to the sea motion video will be given the Motion Sickness Assessment Questionnaire (Gianaros et. al., 2001). Our intention will be to evaluate the effects of the breathing intervention on participants' ability to withstand seasickness inducing visual stimuli.

Breathing and Control Rationales/Interventions

a. Breathing rationale

We are very interested in understanding your responses to the study procedures. Breathing so that the stomach is moving in and out rather than breathing with your chest can help relax you. This stomach breathing, or diaphragmatic breathing, can help you relax and maintain calmness in today's study experience.

b. Breathing Protocol

Please remember the rule: you should do nothing to increase your sense of discomfort while you are practicing the breathing. To start breathing with your stomach, or diaphragm, you should rest in a comfortable position with your head centered, supported and in the midline of your body; your eyes are closed, with smooth eyelids; and smooth forehead; your mouth is relaxed: with lips apart, teeth apart, and tongue relaxed; there's no throat movement; your shoulders are sloped and even; elbows bent; your hands will be in a curled, relaxed position, not touching one another; knees are apart; and feet are pointing away from one another at a 45-90 deg angle. Then, place your right hand just below your rib cage on top of your stomach. Just exhale first to release air from your body—it should be a complete, relaxed release where there is no holding, controlling, or forcing of the release—it is like a balloon collapsing as you let your air go from your body. When you are ready to take your next breath of air in; let the stomach gently rise as if you are pushing your stomach up with the column of air coming in. After you take in a comfortable, normal breath, release your muscles and let the air go just as you did at first when you started the exercise....there is no controlled, gradual release, just let go all at once and have the air move naturally out of your body. Then, pause and rest for a few moments before you take air in again to start another breath cycle. The rest period between breaths is the deepest point of your relaxation when everything is quiet and you relax before taking air in again. (Pause for 10 seconds) From the beginning of this training, you should breathe at a pace that makes you feel comfortable. (Pause for 5 seconds) You also want to breathe naturally and not too deeply in order to avoid over breathing or hyperventilation. If you were to feel light-headed or dizzy, the chances are you are taking in too much air with each breath...take a little less air in on your next breath and the breaths that follow.

c. Control Rationale

We are very interested in understanding your responses to the study procedures. Since we all have our own ways of responding to what happens to us, we are interested in following your responses carefully. The purpose of our project is to better understand the ways in which individuals such as yourself respond to the application of the laboratory procedures.

d. Control Protocol

First of all it is important to remember the rule that you should do nothing to increase your sense of discomfort. Sit up in the chair in an upright posture with your shoulders back and your head resting quietly. Take a few moments to notice your surroundings and let yourself get comfortable and settle in. We would like for you to sit quietly during the procedure and let your attention be directed to the activities going on around you. You should be observing yourself and your environment as you undergo the laboratory experience. Please remain aware of your surroundings and what is happening at any given moment. Take a few minutes now to let yourself be aware of what is happening. We will want you to continue to let yourself be aware of what is happening throughout your remaining time in the laboratory.

Breathing and Control Five Minute Practice Video

After listening to the audio instructions all participants (control and breathing conditions) will practice their breathing for five minutes. The participants will pace their breathing by following a moving oval displayed on the monitor in the laboratory.

Research Measures

- 1. Pre-screening Motion Sickness.** A pre-screening questionnaire will be given to pool of psychology 100 undergraduate students to determine a possible list of seasickness susceptible participants. Sixty participants who complete this questionnaire, score above the mean, and are willing to participate will be asked to schedule an appointment.
- 2. Demographic Information.** Participants will complete several questions regarding their age, year in school, ethnicity, and religion. See attached questionnaire below for list of used questions.
- 3. Heart Rate Variability.** Heart rate variability (HRV) is a physiological index that has demonstrated usefulness in providing a quantitative measure of sympathetic and parasympathetic activity, and an index of autonomic balance. Heart function will be recorded using three Ag/AgCl electrodes using shielded leads connected to BioPac ECG100C electrocardiogram amplifier module. Sampling rate will be set to 2000 samples/second and the Lead I configuration will be used and sensors attached in accord with standard laboratory protocol (Schmidt & Carlson, 2009).
- 4. Respiration Rate.** Respiration rate will be recorded using the respiration module for the BioPac MP100 system. Rate will be recorded as breaths per minute.
- 5. Galvanic skin conductance.** The Biopac MP100 galvanic skin conductance (GSR) module will be used to assess GSR response. Sensors will be attached to the dominant hand in accord with standard Biopac protocol.
- 6. Motion Sickness.** Participants will be instructed to rate their motion sickness before and after the experiment with the MSAQ (Gianaros, et al., 2010). Participants indicate the extent to which they feel each emotion on a 9-point scale: (1=not at all, all the way to 9=severely). The questionnaire measures gastrointestinal, central, peripheral, and sopite-related components of motion sickness. The sum of points from all 16 items are divided by 144 and then multiplied by 100%. This yields the overall motion sickness score. The coefficient alpha for these 5 items was .74 and .88 in previous studies.

- 7. Seasickness Level.** During the experiment, participants will be given instructions to rate their level of seasickness on a 4-point scale. (1=no symptoms, 2=initial symptoms, 3=mild nausea, 4=moderate nausea). The participant will rate their level of seasickness every 60 seconds to the researcher in the room by holding up a corresponding number of fingers.
- 8. Self-Efficacy.** *Self-Efficacy Rating (SER)* is a self-report measure of the participants' level of confidence that they can resist developing seasickness symptoms. Statements such as "how confident are you that you could successfully recognize the signs that you are becoming seasick", are assessed with a seven point Likert scale of responses that range from "not at all confident" to "very confident". The items are summed to attain a self-efficacy score.
- 9. Perceived realism of ocean swells video.** Following the post experiment completion of the MSAQ, participants will be asked two questions about the perceived realism of the video: During the video, how real did it look? During the video, how real did the motion of the boat feel? Responses will be made on a 7-point scale (ranging from 0=not at all real to 6=very real) and will be summed to form a perceived realism scale.

4. Study Population:

Sixty male and female undergraduate University of Kentucky participants between the ages of 18-27 will be included in the study; we expect that the majority of participants will be Caucasian (80%) with a smaller number of African American (15%) and Asian (5%) participants. Exclusion criteria will include students who have medical conditions such as asthma, high blood pressure, panic disorders, anxiety disorder, gastrointestinal disorder, neurological disorder or scores below the mean on the MSSQ prescreening questionnaire (Golding, 2006). Participants will be assigned randomly using a table of random numbers to either condition of the study.

5. Subject Recruitment Methods and Privacy:

Our initial efforts to test the effects of visually induced seasickness will use UK undergraduate students. Research participants will be volunteers recruited from undergraduate psychology classes. Students are not required to participate in any psychology studies, but may receive course credit in their class for their participation (the "value" of such extra credit is decided by their instructor). Students have alternative choices to receive equivalent extra credit in their class if

they opt not to participate in psychology experiments. All participant data will be kept confidential and recorded by participant number only.

Individuals will be recruited using the psychology undergraduate subject pool that requires a brief description of the study be posted on-line, in the computerized participant management program. The brief description will be as follows: Undergraduates between the ages of 18-27 years will be invited to participate in a project entitled, "Using virtual reality to explore self-control and responses to seasickness." This project uses virtual reality to study how training in self-control procedures influences a person's responses to seasickness. Exclusion criteria will include undergraduates who have medical conditions such as asthma, high blood pressure, panic disorders, anxiety disorders, gastrointestinal disorders, neurological disorders, or scores below the mean on the MSSQ prescreening questionnaire (Golding, 2006). The study requires one-hour of time to complete and participants must have a history of motion sickness.

Participants, who sign up for the study on-line and meet the prescreening criteria, will be called or emailed by an undergraduate psychology student to schedule an appointment. The student will use the following script:

Hello, is this " " ? My name is " " and I am calling to schedule an appointment for you to participate in our study entitled, "Using virtual reality to explore self control and responses to seasickness". If you currently have asthma, high blood pressure, panic disorder, anxiety disorder, gastrointestinal disorder, or neurological disorder you may not participate in the study. Would you still be interested in participating in the study? (If individual is not interested politely end the conversation with "Thank you very much for taking the time to visit with me and have a good day") Since you are still interested, I would like to schedule you to come to Room 119 of Kastle Hall on date/time. There is a small waiting area just inside the door and I will meet you there on date/time. Also, please know that the experiment requires you to refrain from eating, drinking alcohol, or smoking at least an hour before your scheduled appointment.

6. Informed Consent Process:

The participant will come in and be given the informed consent sheet that will explain the procedure, resources they can use, and compensation for their involvement. The researcher will also ask if they have any questions they wish to address and the researcher will answer these questions. When all questions (if any)

are answered to the satisfaction of the participant and the informed consent is signed, the study procedures will begin.

7. Research Procedures:

No deception will be used. It is projected that 60 students (Ages 18-27) will participate in the initial study. All participants will be asked if they followed directions on abstaining from food, alcohol, or tobacco products at least an hour before appointment. If they failed to do so, they will be asked to reschedule appointment for another day. Then participants who followed directions will be seated in a comfortable seat for the study. The researcher will explain to the participant that at any point in time if they were to feel discomfort or uneasy in any way, they can stop the study without facing any penalty. The participants will first complete the consent form and then complete the other questionnaires mentioned above. Then the physiological sensors will be attached and heart rate, GSR, and respiration measures will be obtained as a baseline. There will be two randomized groups: 1) participants will be given training in slow-diaphragmatic breathing techniques and will pace their breathing at six breaths per minute; and 2) participants will be given instructions to sit quietly in an upright position while pacing their breathing at a regular pace (twelve breaths per minute). No instruction on the type of breathing will be given. The breathing/control instructions will be administered via a digital disk recording. A researcher will also be present to assist participants and answer any questions during the training.

Following the training instructions, the researcher will then explain to the participant the virtual reality scenario that will be portrayed:

You are to view a video of ocean swells from a boat at sea. You are to look straight ahead for the duration of the experiment. Every 60 seconds you are to rate your seasickness level by responding verbally with a number between 1-4 when you are prompted. (1=no symptoms, 2=initial symptoms, 3=mild nausea, 4=moderate nausea) If a level of four is achieved, before the end of the video, the experiment will be terminated.

Upon the participant's understanding of the guidelines, he/she will then put on a head mounted display (HMD), which includes eye goggles and headphones. Once this is done, the next phase of the study will begin. The researcher will then say:

In a moment we will begin the video. Remember to use your breathing skills that you learned during the experience. (In the case of the attention condition, the instructions will be “remember to use the self awareness skills that you learned”). You will hear the same tone you heard during the training video. Please pace your breathing with the tone as you previously practiced.

The video’s duration will be 10 minutes. During this time, the participant will rate her/his seasickness every 60 seconds by raising a corresponding number of fingers. After each rating is taken, the experimenter will remind the participant to breath slow and regular or to be aware of their surroundings. The experiment will be terminated if a rating of four is reached or if the video is completed, whichever comes first.

At the end of the trial, the participant will rest quietly so that a post baseline physiological assessment can be obtained. Then they will be given several forms (MSAQ, self-efficacy, and perceived realism) to complete.

The debriefing will start by the research assistant asking, “Do you have any questions about the experience?” This will be followed with, “Do you feel OK about leaving at this time?” If there are no further questions and the participant is OK with leaving, they will be excused from the study. If the participant still feels symptoms of seasickness they will be provided with ginger ale, ginger snap cookies, and diaphragmatic breathing instructions with the digital audiotape (If they were in control group). With any additional concerns about leaving, the research assistant will explore those concerns and if necessary provide the participant with information and phone number for the University Health Services (859-323-5823). Then the participant will be excused from the study.

The timeline for the procedure will be as follows:

Introduction and informed consent (5 mins.)

Completion of paper and pencil questionnaires (3 mins.)

Attaching sensors, adaptation and physiologic baseline (10 mins.)

Breathing/Control Training (15 mins.)

Background of scenario (2 min.)

VR ocean scene scenario (10 mins.)

Post-scenario physiologic assessment (5 mins.)

Post-scenario paper and pencil questionnaires (3 mins.)

Debriefing and exit (5 mins.)

8. Resources:

Participants may contact the principal investigators Sarah Stromberg by email (sest224@g.uky.edu) or by telephone (859-489-8737) and Dr. Charles Carlson by email (ccarl@uky.edu) or by telephone (859-257-4394).

9. Potential Risks:

Participants may feel slight motion sickness or stomach illness, but that is expected to be transient. Should the video create undue concerns for the participant, the experimenter will have referral information for the University Health Service.

10. Safety Precautions:

Since one potential risk is that research participants might experience discomfort during the video, participants will be made aware of this risk in the informed consent documents. The informed consent documents will also make it clear that they are not required to participate and that they may terminate their participation in the study at any time, both without penalty. Participants will be instructed to signal the researcher if they desire to stop participation. A research assistant will monitor the experimental procedures to insure compliance with the request to stop participation. Research participants will be debriefed after the study and asked about their experiences. Any concerns will be followed up with appropriate questions and referral information from the researcher. Research participants who request will be given referral information (UK Health Service).

11. Benefit vs. Risk:

The purpose of this research is to develop better methods to treat seasickness symptoms without medication. It is thought that controlled diaphragmatic breathing is the best method to prevent unwanted symptoms. This initial study will evaluate the physiologic and psychological effects of breathing training when coupled with VR technology that is used to stimulate seasickness. Such research is necessary to help inform the scientific and practice communities about the best methods for preventing seasickness without the use of medication that has undesired side effects.

12. Available Alternative Treatment(s):

Not Applicable

13. Research Materials, Records, and Privacy:

Any records or information from the study will be securely locked in a cabinet in room 209 at Kastle Hall. All records collected electronically will be stored on locked

password accessed computers and there will be data stored only on the computer used for recording physiologic data and a computer where the physiologic data and questionnaire data will be merged. Data will be recorded on the computers using an assigned identification number only.

14. Confidentiality:

We will make every effort to protect the research participants' privacy and confidentiality. Each research participant will be assigned an ID#, and all data collection instruments will only contain the ID#. Signed consent forms and the master list containing names and ID# will be kept in a separate locked file in room 209 at Kastle Hall. Research participants will be informed in the consent form about the legal limits of confidentiality (medical emergency, danger to self or others, subpoena by a court).

15. Payment:

There are no monetary costs to participants. As noted above, subjects will receive 1 hour research credit for participation.

16. Costs to Subjects:

Not Applicable

17. Data and Safety Monitoring:

Not Applicable

18. Subject Complaints:

If the participants have any complaints, worries or, questions regarding the research, they can contact the principal investigators Matthew Russell and Dr. Charles Carlson by email or telephone as mentioned above.

19. Research Involving Non-English Speaking Subjects or Subjects from a Foreign Culture:

Not Applicable

20. HIV/AIDS Research:

Not Applicable

21. PI-Sponsored FDA-Regulated Research:

Not Applicable

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Consent to Participate in a Research Study

Use of Self-Regulation in the Management of Motion Sickness

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are being invited to take part in a research study about how people respond to a virtual reality experience involving a video from a boat at sea. If you volunteer to take part in this study, you will be one of about 60 people to do so at the University of Kentucky.

WHO IS DOING THE STUDY?

The persons in charge of this study are Sarah Stromberg and Dr. Charles Carlson, Ph.D., of the University of Kentucky, Departments of Oral Health Sciences and Psychology. There may be other people on the research team assisting at different times during the study.

WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of the study is to observe the effects of self-control strategies on seasickness symptoms. By doing this study, we hope to learn how to help people develop effective strategies for managing themselves in settings where they experience seasickness.

ARE THERE ANY REASONS WHY YOU SHOULD NOT TAKE PART IN THIS STUDY?

Reasons to be excluded from participation include past history of anxiety disorder, panic disorder, gastrointestinal disorder, neurological disorder, and medical conditions including asthma and high blood pressure.

WHEN IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The research procedures will be conducted in Room 119 of Kastle Hall. You will need to come to Kastle Hall only once during the study. The visit should take no more than one hour. The total time you will be asked to volunteer for this study is one hour.

WHAT WILL YOU BE ASKED TO DO?

We are asking you to participate in a study examining how people respond to seasickness. If you choose to participate, first you will be given an equal chance to experience either a breathing training exercise or self-awareness exercise. Then you will be asked to watch a video of ocean swells from a boat in the sea. Using the (VR) technology will require you to wear a head mounted display (HMD), which consists of goggles and headphones. During the video, we will record your heart rate, respiration, and skin conductance. At the beginning of the study, a research assistant will place sensors for these recordings on you. We will also ask you to complete several questionnaires before the video and after the video. You will have an equal chance of being given self-awareness training or breathing training before you do the virtual reality experience. The questionnaire data will be used for research purposes only. Your participation in this study is voluntary. It should take no more than 1 hour to complete. Even if you agree to participate, you may terminate your participation at any time without penalty.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

There is the possibility that you may feel some discomfort (e.g., nausea or mild anxiety) during the video. We will do what we can to alleviate any distress that you might experience as a result of this study. However, if distress is a serious concern of yours, you may want to decline

participating in the study. You will receive credit for the study even if you terminate your participation before the session is over. In addition to the risks listed above, you may experience a previously unknown risk or side effect.

WILL YOU BENEFIT FROM TAKING PART IN THIS STUDY?

You will not get any personal benefit from taking part in this study.

DO YOU HAVE TO TAKE PART IN THIS STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering.

IF YOU DON'T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to be in the study, you may sign up for another study or alternative assignment rather than take part in the study.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

We will make every effort to keep private all research records that identify you to the extent allowed by law. Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered. You will not be personally identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private. We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. Each research participant will be assigned an identification number (ID#, not your UK Student

ID#), and all data collection instruments will only contain the ID#. Signed consent forms and the master list containing names and ID# will be kept in a locked file located in Room 209 Kastle Hall. You should know, however, that there are some circumstances in which we may have to show your information to other people. For example, the law may require us to show your information to a court or to tell authorities if you report information about a child being abused or if you pose a danger to yourself or someone else, or officials of the University of Kentucky may look at or copy portions of study records that identify you.

CAN YOUR TAKING PART IN THE STUDY END EARLY?

If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study. The individuals conducting the study may need to withdraw you from the study. This may occur if you are not able to follow the directions they give you, if they find that your being in the study is more risk than benefit to you, or if the study is stopped early for a variety of scientific reasons.

ARE YOU PARTICIPATING OR CAN YOU PARTICIPATE IN ANOTHER RESEARCH STUDY AT THE SAME TIME AS PARTICIPATING IN THIS ONE?

You may take part in this study if you are currently involved in another research study. It is important to let the investigator/your doctor know if you are in another research study. You should also discuss with the investigator before you agree to participate in another research study while you are enrolled in this study.

WHAT HAPPENS IF YOU GET SICK OR HURT DURING THE STUDY?

If you believe you are hurt or if you get sick because of something that is due to the study, you should call Dr. Charles Carlson, Ph.D. at (859) 257-4394 immediately. Charles Carlson, Ph.D., will help determine what type of treatment, if any, is best for you at that time.

It is important for you to understand that the University of Kentucky does not have funds set aside to pay for the cost of any care or treatment that might be necessary because you get hurt or sick while taking part in this study. Also, the University of Kentucky will not pay for any wages you may lose if you are harmed by this study. The medical costs related to your care and treatment because of research related harm will be your responsibility.

WILL YOU RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

You will receive course credit, for one experimental hour for taking part in this study.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS, CONCERNS, OR COMPLAINTS?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigators, Sarah Stromberg at (859)-489-8737 or Charles Carlson, Ph.D., at (859) 257-4394. If you have any questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky at 859-257-9428 or toll free at 1-866-400-9428. We will give you a signed copy of this consent form to take with you.

WHAT IF NEW INFORMATION IS LEARNED DURING THE STUDY THAT MIGHT AFFECT YOUR DECISION TO PARTICIPATE?

If the researcher learns of new information in regards to this study, and it might change your willingness to stay in this study, the information will be provided to you. You may be asked to sign a new informed consent form if the information is provided to you after you have joined the study.

Signature of person agreeing to take part in the study

Date

Printed name of person agreeing to take part in the study

Name of [authorized] person obtaining informed consent

Date

Signature of Investigator

Demographic Information

What is your present age? _____

What is your present year in school? _____

What is your ethnic group?

White/Caucasian _____

African American _____

Asian _____

Hispanic _____

Native American _____

Other _____

**Motion sickness susceptibility questionnaire short-form
(MSSQ-Short)**

This questionnaire is designed to find out how susceptible to motion sickness you are, and what sorts of motion are most effective in causing that sickness. Sickness here means feeling queasy, nauseated, or actually vomiting

1. **As a child (before age 12)**, how often you felt sick or nauseated by each item (tick boxes)

| | Not Applicable- Never Traveled | Never Felt Sick | Rarely Felt Sick | Sometimes Felt Sick | Frequently Felt Sick |
|--------------------------------|-----------------------------------|-----------------|------------------|---------------------|----------------------|
| Cars | | | | | |
| Buses or Coaches | | | | | |
| Trains | | | | | |
| Aircraft | | | | | |
| Small boats | | | | | |
| Ships, e.g. Channel Ferries | | | | | |
| Swings in playgrounds | | | | | |
| Merry-go-rounds in playgrounds | | | | | |
| Fair/Carnival Rides | | | | | |
| | t | 0 | 1 | 2 | 3 |

2. **Over the last 10 years (approximately)**, how often you felt sick or nauseated by each item (tick boxes)

| | Not Applicable- Never Traveled | Never Felt Sick | Rarely Felt Sick | Sometimes Felt Sick | Frequently Felt Sick |
|--------------------------------|-----------------------------------|-----------------|------------------|---------------------|----------------------|
| Cars | | | | | |
| Buses or Coaches | | | | | |
| Trains | | | | | |
| Aircraft | | | | | |
| Small boats | | | | | |
| Ships, e.g. Channel Ferries | | | | | |
| Swings in playgrounds | | | | | |
| Merry-go-rounds in playgrounds | | | | | |
| Fair/Carnival Rides | | | | | |
| | t | 0 | 1 | 2 | 3 |

Motion sickness Assessment Questionnaire (MSAQ)

Not at all

Severely

1---2---3---4---5---6---7---8---9

1. I felt sick to my stomach (G)
1---2---3---4---5---6---7---8---9

9. I felt disoriented (C)
1---2---3---4---5---6---7---8---9

2. I felt faint-like (C)
1---2---3---4---5---6---7---8---9

10. I felt tired/fatigued (S)
1---2---3---4---5---6---7---8---9

3. I felt annoyed/irritated (S)
1---2---3---4---5---6---7---8---9

11. I felt nauseated (G)
1---2---3---4---5---6---7---8---9

4. I felt sweaty (P)
1---2---3---4---5---6---7---8---9

12. I felt hot/warm (P)
1---2---3---4---5---6---7---8---9

5. I felt queasy (G)
1---2---3---4---5---6---7---8---9

13. I felt dizzy (C)
1---2---3---4---5---6---7---8---9

6. I felt lightheaded (C)
1---2---3---4---5---6---7---8---9

14. I felt like I was spinning (C)
1---2---3---4---5---6---7---8---9

7. I felt drowsy (S)
1---2---3---4---5---6---7---8---9

15. I felt as if I may vomit (G)
1---2---3---4---5---6---7---8---9

8. I felt clammy/cold sweat (P)
1---2---3---4---5---6---7---8---9

16. I felt uneasy (S)
1---2---3---4---5---6---7---8---9

Self-Efficacy Scale

Please use this scale to respond to all of the following questions:

FOR EACH ITEM, PLEASE CIRCLE THE CORRECT NUMBER

(Not At All Confident) —————▶ (Very Confident)
1 2 3 4 5 6 7

1. How confident are you that you could successfully recognize the signs that you are becoming seasick?
1 2 3 4 5 6 7
2. How confident are you that you could successfully control feelings of stomach sickness, queasiness, nausea, and vomiting?
1 2 3 4 5 6 7
3. How confident are you that you could successfully control feeling sweaty, clammy, cold sweat, and hot/warm?
1 2 3 4 5 6 7
4. How confident are you that you could successfully control feelings of faintness, lightheadedness, disorientation, dizziness, or spinning?
1 2 3 4 5 6 7
5. How confident are you that you could control feeling annoyed/irritated, drowsy, tired/fatigues, or uneasy?
1 2 3 4 5 6 7
6. How confident are you that you could successfully control the symptoms of seasickness overall if you were on a boat?
1 2 3 4 5 6 7

Perceived realism of ocean swells video

For the questions below please circle a response using a 7-point scale (ranging from 0=not at all to 7=very real) to rate each question or circle yes or no.

During the video, how real did it look?

0----1----2----3----4----5----6

During the video, how real did the boat motion feel?

0----1----2----3----4----5----6

During the video, did you look away from the screen at any point? (Yes or No)

During the video, did you close your eyes at any point? (Yes or No)