PARTICIPANT CONSENT FORM

Determining the impact of aging on respiratory muscle energetics during exercise

We invite you to participate in a research study conducted by Yannick Molgat-Seon of the Department of Kinesiology and Applied Health at The University of Winnipeg, who may be reached by phone at (204) 988-7640 or by email at y.molgat-seon@uwinnipeg.ca. The study will investigate how healthy aging affects the function of the respiratory muscles during exercise.

You are being invited to take part in this research study because you are between the ages of 20-80 years (inclusively), do not smoke, do not have a history of lung or heart disease, and are able to safely perform exercise.

Your participation is voluntary. You have the right to refuse to participate in this study. If you decide to participate, you may still choose to withdraw from the study at any time without any negative consequences.

Before you decide, it is important for you to understand what the research involves. This consent form will tell you about the study, why the research is being done, what will happen to you during the study, and the possible benefits, risks and discomforts.

This research has been approved by the University Human Research Ethics Board. If you wish to participate in this study, you will be asked to sign this form.

Background information:

During exercise, our respiratory muscles need to work hard to move air into and out of our lungs. Aging causes several changes to the lungs, rib cage, and respiratory muscles. These changes impact how our respiratory system functions. We know how aging affects the function of our respiratory system at rest, but less is known about how aging affects the respiratory system's response to exercise. In particular, the respiratory muscles, like other muscles in the body, may weaken over time, but we don't fully know how aging might affect how the respiratory muscles respond to exercise.

What is the purpose of this study?

This study seeks to improve our understanding of how aging influences respiratory muscle function during exercise.

Who can participate in this study?

You may be able to participate in this study if you:

- are between the ages of 20-80 years (inclusively)
- have normal lung function based on your age and sex
- have a body mass index greater than 18 or less than 30 $kg \cdot m^{-2}$
- are able to perform exercise
- can fluently read and write in English.

Please note that your lung function and body mass index will be measured during visit 1 after written informed consent is obtained. If you do not meet the respective criteria, you will not be able to participate in the remainder of the study.

Who should *NOT* participate in this study?

You cannot participate in this study if you have:

- a history of or current symptoms of heart and/or lung disease
- any medical condition that prevents you from exercising safely, such as: a problem with your heart; a serious infection within your body; a disorder the affects your nerves, bones and/or muscles; or other health problem that will be made worse with exercise testing.
- a cardiac pacemaker
- had recent nasopharyngeal surgery
- an ulcer or tumor in your esophagus
- current sinusitis (inflammation of the sinuses) or epistaxis (nose bleed)
- allergies to latex and sensitivities to local anaesthetics
- current smoker or previously smoked more than 10 pack-years
  - *10 pack-years is equivalent to having previously smoked 1 pack of cigarettes per day for 10 years*

* *Please note that, for safety reasons, you may be excluded from the study if you are exposed to or are experiencing symptoms of coronavirus disease 2019 (COVID-19)*

What does the study involve?

Overview of the Study: You will be asked report to the Duckworth Centre at the University of Winnipeg on two separate visits. The visits will be separated by a minimum of 48 hours. Prior to each visit, all experimental procedures will be explained to you in detail. On visit 1, you will answer questions about your basic medical history and the amount of physical activity you do. This will be followed by breathing tests. Next, a thin flexible tube will be inserted through your nose and into your stomach and you will be asked to perform an exercise test on a stationary bicycle. On visit 2, the same thin flexible tube will be inserted through your nose and into your stomach. You will then perform a series of 6 breathing tests while seated on a stationary bicycle. Each of the 2 visits will take approximately 2 hours. If you complete both testing visits, approximately 4 hours of your time will have been spent as a participant in this study.

Specific Procedures:

Visit 1

After signing the consent form, you will be asked to answer a series of questions relating to your medical history (for example: *Do you have any allergies?*). You can choose not to answer any questions that make you feel uncomfortable. Measurements of your height and weight will then be taken. This will be followed by breathing tests to measure how your lungs are functioning. This requires that you to breathe quickly and deeply through a mouthpiece while wearing nose clips (so that you are only breathing out of your mouth).

Second, a very thin tube (less than 2 millimeters in diameter) will be placed through your nose and into your esophagus (the tube connecting your nose to your stomach) and stomach. Before inserting the thin tube, an anaesthetic (numbing) spray will be applied to your nose and throat to minimize any discomfort. The purpose of the tube is to measure breathing pressures and the electrical activity of your main breathing muscle (the diaphragm). This will be carried out by Yannick Molgat-Seon, who is skilled in the procedure. Next, 2 small sensors will be placed on the right side of you neck to measures the activity of your respiratory muscles.

Third, you will perform an exercise test on an upright stationary bicycle while breathing through a mouthpiece and wearing a nose clips. The test will begin with a 1-minute warm-up and become more difficult until you feel that you cannot cycle any more. The exercise test should last approximately 10-15 minutes. During the test, it is necessary that you breathe through a mouthpiece while wearing nose clips so that your breathing can be monitored. A small clip will also be placed on your finger to non-invasively monitor the amount of oxygen in your blood. Visit 1 of testing should take approximately 2 hours.

Visit 2

First, a very thin tube (less than 2 millimeters in diameter) will be placed through your nose and into your esophagus (the tube connecting your nose to your stomach) and stomach. Before inserting the thin tube, an anaesthetic (numbing) spray will be applied to your nose and throat to minimize any discomfort. The purpose of the tube is to measure breathing pressures and the electrical activity of your main breathing muscle (the diaphragm). This will be carried out by Yannick Molgat-Seon, who is skilled in the procedure. Next, 2 small sensors will be placed on the right side of you neck to measures the activity of your respiratory muscles.

Second, you will sit a stationary bicycle while breathing through a mouthpiece and wearing nose clips without exercising, and you'll be asked to perform 6 breathing trials. During each trial, you will take deep and rapid breaths to mimic specific breathing patterns you performed during exercise on visit 1. Each trial will last approximately 5 minutes and you will have at least 5 minutes of rest between each trial. Visit 2 of testing should take approximately 2 hours.

What are my responsibilities?

The day before each visit, you will be asked to avoid strenuous exercise. You will also be asked to avoid consuming caffeine (*e.g.*, coffee, tea, etc.) 3 hours prior to each visit.

What are the possible harms and discomforts?

Risks and discomforts of the study are related to the measurements being performed. In the unlikely event of a medical emergency during the study, immediate care will be provided by the researchers, who all have current first-aid certificates.

Lung Function Testing: You may experience mild light-headedness or breathlessness, or you may cough or wheeze at the end of some of the breathing tests, but these sensations are temporary and

subside once the test has stopped for a few moments. There are no harms or discomforts associated with the breathing apparatus.

Cycle Exercise Tests: How people respond to exercise is not always predictable, and sometimes unexpected problems happen that might require medical attention. You are asked to report immediately any unusual symptoms during the test. You may stop the test when you wish to if you feel tired or uncomfortable. Every effort will be made so that the tests are comfortable and as safe as possible. Potential risks from maximal exercise include:

- vomiting (5%)
- abnormal blood pressure (pressure of your blood) (less than 1%)
- fainting (less than 1%)
- disorders of heartbeat (less than 0.1%)
- very rare instances of heart attack (less than 0.001%)

If you feel that you are experiencing any side effects as a result of the study you should immediately report this to the researchers conducting the test.

Thin flexible tube measurements: You may feel mild discomfort or soreness in your nose and the back of your throat when the thin flexible tube is inserted in your stomach and through your esophagus. You may also experience slight discomfort while swallowing the tube and during the removal of the tube (fewer than 1 out of 20 people). This may cause some people to vomit (fewer than 1 out of 100 people).

There is also a risk of a minor nosebleed when the tube is inserted or removed (fewer than 1 out of 20 people), but when the tube is in position those problems will go away. A numbing spray called Lidocaine will be used to minimize the discomfort. Adverse reactions to Lidocaine are very rare but include:

- light-headedness (less than 1%)
- blurred/double vision (less than 1%)
- excitement (less than 1%)
- confusion (less than 1%)
- dizziness (less than 1%)
- seizure (less than 1%)
- sensations of heat, cold or numbness (less than 1%)

You will not be allowed to participate in the study if you are known to be sensitive to local anaesthetics (numbing or freezing medications) or if you have allergies to latex. We are unaware of any laboratory that has experienced any of these adverse reactions to such a small amount of Lidocaine.

There is also a small risk that the thin flexible tube may be placed in the wrong position. In some extremely rare cases, the thin flexible tube can enter your trachea (wind pipe). This happens in fewer than 1 out of 2000 people. If this occurs you may experience mild discomfort in the back of

your throat and you may cough. When this occurs the thin flexible tube will be pulled out immediately and re-positioned.

What are the potential benefits of participating?

No one knows whether or not you will benefit from this study. There may or may not be direct benefits to you from taking part in this study. We hope that the information learned from this study can be used in the future to help us understand more about the normal healthy aging process. You will receive a summary of your personal results.

What happens if I decide to withdraw my consent to participate?

You may withdraw from the study at any time without giving reasons. If you choose to enter the study and then decide to withdraw at a later time, all data collected about you during your enrolment in the study will not be retained for analysis.

Can I be asked to leave the study?

If you are not able to follow the requirements of the study or for any other reason, the study investigator may withdraw you from the study. If this is the case, you will be notified by telephone.

Will my taking part in this study be kept confidential?

Your confidentiality will be respected. No information or records that disclose your identity will be published without your consent, nor will any information or records that disclose your identity be removed or released without your consent unless required by law. All research-related information collected as part of this study will be anonymized. You will be assigned a unique study number as a participant in this study, and only this number will be used on any research-related information collected about you during the course of this study, so that your identity (*i.e.*, your name or any other information that could identify you) as a participant in this study will be kept confidential. Information that contains your identity will remain only with the Principal Investigator. Your rights to privacy are legally protected by federal and provincial laws that require safeguards to ensure that your privacy is respected and also give you the right of access to the information about you that has been provided to the research team and, if need be, an opportunity to correct any errors in this information. Further details about these laws are available on request to the Principal Investigator.

Digital data files will be kept on an encrypted, password-protected computer in Yannick Molgat-Seon's laboratory and hard copy data will be stored in Yannick Molgat-Seon's office in a filing cabinet under lock and key. Only authorized members of the research team and Yannick Molgat-Seon will have access to the data. All data will be kept for a minimum of 7 years and will be disposed of by permanently erasing digital files and securely shredding hard copy files.

Precautions concerning COVID-19

The research site is located in the Duckworth Centre at the University of Winnipeg, which is under the jurisdiction of Winnipeg Regional Health Authority and Manitoba Public Health. As such, we are taking all necessary safety precautions to reduce the risk of spread of COVID-19 and expect you to follow public health directives as well. Yannick Molgat-Seon's laboratory has a COVID-

19 preparedness plan that conform to Manitoba Public Health guidelines and has been approved by the Safety Office at the University of Winnipeg.

If you feel that you are from a vulnerable group with respect to COVID-19 effects (*e.g.*, senior, immuno-compromised), please discuss your participation with the research team before consenting. You are under no obligation to participate and nothing bad will happen if you change your mind about participating in the research.

Because you are coming onto campus, the following safety protocols must be followed, as per University policy:

- Screening – as per requirements for persons coming onto campus.
- Take appropriate precautions (*e.g.*, face covering/cloth mask) if taking public transportation and entering public indoor spaces.
- Wash your hands upon coming onto campus and entering a building. Hand sanitizer will be made available to you.
- Physical distancing will be maintained, at all times, and if not possible wear a face covering/cloth mask. Otherwise, we will provide you with PPE.

We will be collecting personal contact information that we must retain in order to follow up with you and/or conduct contact tracing if you may have been exposed to COVID-19 in coming to the research site. Contact information will be kept separate from data collected through the research study to allow for de-identification of the research data.

You maintain your right to withdraw from the study at any time, including research data. If you do withdraw, we will continue to maintain your contact information and will only give it to Occupational Health if required for contact tracing.

We cannot guarantee anonymity as the personal contact information identifies you as a participant; however, your personal information will not be matched with the data collected as part of this study.

Who do I contact if I have questions about the study during my participation?

If you have any questions or desire further information about this study before or during participation, or if you experience any adverse effects, you can contact Yannick Molgat-Seon by phone at (204) 988-7640 or by email at y.molgat-seon@uwinnipeg.ca.

If you have any questions or concerns about this study or the way it is being conducted, please contact the researcher directly. If you have any remaining concerns about the conduct of this study that the researcher has not been able to address, you may contact the Ethics Program Officer at 204-786-9058 or by email at ethics@uwinnipeg.ca.

Please note that your participation is voluntary and you may refuse to answer any question(s) and are free to stop participating in the study any time prior to publication and/or presentation of the findings without consequence. By consenting to participate, you do not waive any rights to legal recourse in the event of research-related harm. If you wish to receive a summary of the study's results please contact Yannick Molgat-Seon by phone at (204) 988-7640 or by email at y.molgat-seon@uwinnipeg.ca.

My signature on this consent form means:

- I have read and understood the subject information and consent form.
- I have had sufficient time to consider the information provided and to ask for advice if necessary.
- I have had the opportunity to ask questions and have had satisfactory responses to my questions.
- I understand that all of the information collected will be kept confidential and that the results will only be used for scientific objectives.
- I understand that my participation in this study is voluntary and that I am completely free to refuse to participate or to withdraw from this study at any time
- I understand that I am not waiving any of my legal rights as a result of signing this consent form.
- I understand that there is no guarantee that this study will provide any benefits to me.

Name (please print): _____

Signature: _____ Date: _____

Principal Investigator's Signature: _____ Date: _____

A copy of this consent form will be provided to you. Thank you for your consideration.