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**Overview**

The Skeletal Biology and Biomechanics Lab (SBBL) is a research lab in the Department of Human Evolutionary Biology (HEB) located on the fifth floor of the Peabody Museum of Archaeology and Ethnography. SBBL conducts human subjects research focusing on the biomechanics and physiology of activity and movement. Our research primarily includes human subjects from the Harvard community, with some projects recruiting participants from the greater Boston area population.

This document outlines standard operating procedures (SOPs) to minimize risk of SARS-CoV-2 transmission for lab members and participants during the COVID-19 pandemic. These SOPs apply to workspaces and schedules, transit pathways, personal protection and hygiene, contact with research participants, and disinfection of surfaces and research materials. In addition to these general SOPs we have also developed SOPs for the types of data collection techniques used in the SBBL. The procedures, attached as appendices, are designed to fit within the framework of the Harvard University Research Laboratory Re-Entry Plan (May 14th).

As the situation changes and we learn more about COVID-19, we expect to modify the SOPs in this document to further advance safety goals. In addition, active IRB protocols will be adjusted as necessary to address safety concerns and procedures via consultation with the Harvard IRB.

**1. Physical Distancing and Transit Pathways**

The SBBL lab space consists of two unconnected rooms with entry points from a communal department hallway: Peabody 55d and Peabody 55e. 55d is not used for human subjects research. Therefore, 55d is designated as a single-occupancy room with only one lab member allowed to use the workspace at any time. Human subjects research trials are conducted in 55e, mainly locomotion studies on an instrumented treadmill. Occupancy of 55e will ordinarily be limited to one lab member and one study participant at any time.

1.1. Separation of space using designated zones

The lab space in 55e is divided into two zones, designated as the Experimenter Zone and Participant Zone, which will be 6 feet apart and clearly demarcated by colored tape floor markings. The Experimenter Zone includes the data collection workstation, most of the equipment storage units, and remote treadmill controls. The Participant Zone includes the instrumented treadmill. When 55e is occupied only by a lab member, the experimenter can enter and use the Participant Zone for access to equipment or other necessary work up to 15 minutes *before* a participant is scheduled to arrive. Within 15 minutes prior to participant arrival, lab members will stay out of the Experimenter Zone.

1.2. Participant movement and physical distancing

We will follow University guidelines to regarding exclusion criteria, transportation, attestation of lack of symptoms and use of a university-supplied facemask within the building. After entering 55e, participants will be guided by floor markings to an area of the Participant Zone six feet away from the boundary. Transit to and from the instrumented treadmill will be marked by arrows on the floor and will guide the participant's movement on the opposite side of the treadmill from the Experimenter Zone. During necessary periods of close contact for motion capture marker placement and similar procedures, contact will only occur at the boundary between the zones at a designated contact point that is visually marked and at least six feet away from the treadmill and data collection workstation.

If a subject needs to change his/her clothes we will either direct them next door to Peabody 55d (if it is empty and hasn’t been used in the last 2 hours) or have the experimenter leave the room while the subject changes.

1.3. Restrooms

If participants needs to change use a restroom, they will be verbally guided to the appropriate restroom on the 5th floor of the Peabody Museum designated for use by the SBBL.

1.4. Interactions between the experimenter and participant

When necessary, the experimenter and participant will come into close contact at the designated contact point at the boundary between the Experimenter Zone and Participant Zone. Both the experimenter and participant will wear face masks and plastic face shields, and the experimenter will also wear a lab coat that has not been used for 24 hours. Close contact will not exceed *5 minutes at a time*, or *15 minutes total*. The contact point will be at least six feet away from the instrumented treadmill and data collection workstation. If required contact is greater than 5 minutes, 10-minute breaks will be used to limit possible aerosol transfer between the individuals and to allow for purification of the air in the lab space (see Sanitation and Hygiene section). Whenever possible, the experimenter and participant will face in opposite directions during contact to reduce comingling of expired air. Examples of instances requiring close contact include but are not limited to: placement of motion capture markers, placement of EMG electrodes, fitting of a respirometry mask, blood draws, and measurements of body proportions. Further information on each procedure is detailed in the appendices to this document. At the end of the experimental trial, removal of any attached equipment will be done by the participant whenever possible, and removed equipment will be placed by the participant at the contact point to be collected and disinfected by the experimenter once the participant has left the lab. After any contact, the experimenter will wash his/her hands.

1.5. Data collection

During data collection the experimenter will be located at the data collection workstation, which is eight feet away from the instrumented treadmill. A plexiglass barrier (approximately 5 x 5 feet) will provide further physical separation between the experimenter and the participant. The treadmill is controlled remotely and will be operated by the experimenter from behind the plexiglass barrier. At the end of data collection the participant will be guided back to an area six feet away from the zone boundary, and will remove any markers or other equipment themselves to the maximum extent possible. If further close contact is required between the lab member and participant during data collection it will occur at the designated contact point, for no longer than 5 consecutive minutes, and will count towards the 15 minutes of total allowable contact time.

Drinking will not be permitted by the participant during the experiment.

1.6. Diagram of Peabody 55e



**2. Temporal Separation of Lab Members**

The SBBL lab space is scheduled using a communal Google Calendar booked on a first-come-first-served basis, and we will continue scheduling in this manner with one modification. In order to reduce the risk of aerosol transmission, lab members will be temporally separated in their use of 55d or 55e. Because 55d and 55e are not connected and do not share an air system, different lab members may use the two rooms simultaneously. There will be no limits on how long lab members may continuously reserve either room, but reserved time blocks must start at least 60 minutes after occupancy of the same room by another lab member has ended. If the same lab member reserves non-consecutive blocks but no other lab member occupied the room in between, there will be no limits to scheduling.

To allow for appropriate cycling of room air via HEPA air purification systems (see Sanitation and Hygiene section), we will schedule a minimum of 30 minutes between uses of the room by different lab members.

The shared lab calendar will be monitored by the Lab Safety Officer (LSO) to ensure the lab spaces are occupied safely following these protocols. If a lab member or participant displays symptoms of or tests positive for COVID-19 after using the lab space, the LSO will be immediately contacted and will implement the emergency lab shutdown including suspension of the lab calendar. For more details on the emergency lab shutdown procedure, see Section 7.

**3. Sanitation and Hygiene**

3.1. Limiting aerosol transmission risks

In accordance with University policy, lab members and participants will be required to wear face masks at all times in the Peabody Museum (with the one exception of when participants exchange the facemask for a respirometry mask as described above). Physical distancing of at *least six feet* will be maintained at all times except for necessary contact periods, and temporal separation of lab space use will be enforced (as outlined in the previous sections). When working in close contact, face shields will also be used.

Air in the lab space in 55e will be filtered using commercially available HEPA air purification systems. According to Siemens, the total volume of air in 55e is approximately 5,000 ft3, and the central air system supplies 450 ft3×min-1 of air into the room with a 335 ft3×min-1 exhaust rate. One or more standalone HEPA air purifiers will be placed in 55e on the boundary between the Experimenter Zone and Participant Zone. The minimum total purified airflow will be 500 ft3×min-1, therefore purifying a total volume equal to the size of the room every 10 minutes. The purifiers will be oriented so that they do not directly vent towards either the participant or the experimenter, instead venting towards unoccupied parts of the room so that airflow within the room does not transmit droplets between the two zones.

3.2. Personal hygiene procedures

Immediately upon entering either 55d or 55e, lab members and participants must wash their hands in the sinks located in each room. Soap and disposable paper towels will be provided next to each sink along with a disposal bin. Both lab members and participants will also be encouraged to further wash their hands whenever necessary. Alcohol-based disinfectant gel will be available in the Experimenter Zone, Participant Zone, and the entryways. All lab occupants will be instructed to disinfect their hands with gel after touching any lab equipment or surfaces in the lab spaces, and after exiting the lab space.

3.3. Disinfecting procedures

After entering a lab space and washing their hands, lab members will execute a standard disinfecting procedure using gloves, a lab coat and protective eyewear. All lab surfaces and equipment that will be used by the lab member and participant will be sterilized using Lysol Disinfecting Wipes/Spray or an [equivalent disinfectant](https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2) approved for use against SARS-CoV-2 as outlined by the EPA). Items to be disinfected include but are not limited to: plastic face shields, door handles, computer screens and mice (and keyboard if necessary), desk surfaces, treadmill rails, and any reusable equipment as specified in the SOPs in the appendices. Disposable wipes will be thrown away in designated and labeled bins located in the lab in both the Experimenter and Participant zones.

If multiple participants visit the lab during a single scheduled block of time, the lab member will repeat the disinfecting procedure during the time between the participants occupancy and switch to a lab coat that has not been used for at least 24 hours. At the end of a lab member's scheduled block they will repeat the disinfecting procedure, ensuring that any relevant surfaces and equipment are disinfected twice between usage by different lab members. If the lab member is the last scheduled user of the lab for the day they will place the disposal bins in the hallway outside of the lab space for pickup by the custodial staff overnight.

The PI and Lab Safety Officer will monitor the availability of disinfecting materials and will make sure that ample supplies are available in the lab spaces at all times.

**4. PPE for Experimenters and Participants**

4.1 Masks**.** All lab members and participants will wear Type II 3-ply surgical face masks at all times as provided by the University. Masks will be disposed of after use. Participants may briefly remove their surgical mask only when putting on a respirometry or spirometry mask and in these instances, safety procedures outlined in Appendix 4 will be followed namely having the participant hold his/her breath, and turn his/her face away from the experimenter for this brief period.

4.2 Face shields. All lab members and participants will wear reusable plastic face shields when in close contact (defined as less than 6 feet)

4.3 Lab coats. All experimenters will use clean lab coats that have not been worn for at least 24 hours, and will exchange lab coats between participants.

4.4 Keyboard. Saran wrap will be used to cover the keyboard. Each experimenter will be responsible for changing the saran wrap after each use.

**5. Training and Lab Maintenance**

When possible, the SBBL lab team will implement virtual training of researchers on proper equipment and lab space use via Zoom. In instances when virtual training is not possible, two lab members may schedule and occupy a lab space for training purposes. During any training occupancy, lab members will adhere to at least six feet physical distancing, wear appropriate PPE, adhere to proper hygiene and disinfection procedures, and will have the HEPA air purification systems on. Any maintenance issues regarding lab equipment will be handled remotely whenever possible. If the expertise of a lab member is required for specific equipment maintenance, they will schedule time to enter the lab space alone to work on maintenance. If equipment maintenance is required by a lab member, they will maintain remote communication with the other lab members regarding the use equipment for their research and the progress of equipment maintenance.

**6. Adherence**

This document will be distributed to and reviewed by all researchers with access to the SBBL. Failure to adhere to the guidelines provided in this document will result in the immediate suspension of access to the SBBL.

**7. Emergency Lab Shutdown Procedure**

The Lab Safety Officer (LSO) will continue to work from home and will be held in reserve in case of a lab shutdown. If a lab member tests positive for COVID-19 they will immediately contact the LSO, who will alert the remaining lab members via phone of their need to immediately self-isolate. The LSO will also immediately alert the local safety committee of the positive test and facilitate any necessary communication between the lab members and the safety committee for contact tracing.

The LSO will then travel to the lab and lab offices to implement the safe shutdown plan, coordinating with the Peabody Museum building manager. In accordance with CDC recommendations, before the LSO comes to the lab, and if possible the windows will be left open for 24 hours. All active lab work will be shut down, and the LSO will remove and store any equipment/reagents according to their appropriate protocols. They will communicate with the lab members to identify any physical or virtual data located in the lab that are necessary to continue work from home, and will transfer the data to the lab members’ home locations either electronically or via mail. In addition, any notebooks or other personal items left in the lab and requested by the isolated lab members will be mailed to their home locations.

The LSO will coordinate with the building manager and the local safety committee to disinfect all lab areas and lab offices. They will lock all spaces and post notices at all entrances that the lab is shut down for safety reasons and no on-campus work is allowed until the end date of the isolation period. They will continue daily contact with lab members to assess whether they need him to retrieve more items or data from the lab spaces, and if so will coordinate additional on-campus visits with the building manager and local safety committee. They will also provide updates to the safety committee as frequent as they deem necessary.

If lab members who were working from home and had no recent contact with on-campus lab members request access to the lab spaces during the isolation period, the LSO will forward those requests to the local safety committee. If access is requested to retrieve items or data that will be done by the LSO, and if access is requested in order to do research work the LSO will facilitate permission from the safety committee. Ideally the LSO will be the only person to physically visit the lab and office spaces during the isolation period.

At the end of the isolation period the LSO will coordinate the reopening of the lab. They will do any necessary rearrangement of the lab space and/or change movement patterns to continue to limit contact between lab members upon reopening. They will then alert lab members when it is appropriate to return to on-campus work.

**Appendix I: List of Available PPE and Disinfectants**

**PPE:** masks, face shields, lab coats

**Disinfectants:** Lysol Disinfecting Wipes/Spray or equivalent; Enzol detergent and CIDEX OPA; 5% chlorine bleach solution

**Other Relevant Supplies:**

**Local Filtration:** HEPA air purification systems

**See attached documentation for the following appendices**

**Appendix 2: Motion capture Procedures**

**Appendix 3: Electromyography Procedures**

**Appendix 4: Respirometry/Spirometry Procedures.**

**Appendix 5: Ultrasound Procedures**

**Appendix 6: Blood Draw Procedures**