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Cutaneous reflexes during heating of the foot sole

You are invited to participate in a study conducted by Dr. Leah Bent, Tushar Sharma, and Erika Howe in the department of Human Health and Nutritional Sciences at the University of Guelph. The purpose of this study is to determine if heating the foot sole will enhance an individual's cutaneous reflexes to maintain postural balance experienced during daily activities.

This study will take place at the University of Guelph. Your involvement will consist of one session lasting approximately 2 hours. Prior to experimental testing, you will be asked to complete a screening questionnaire which asks questions related to your physical health. To ensure all information obtained will remain confidential, you will be assigned a participant ID number. If you are not eligible to continue with the study or should you choose to withdraw, any information obtained from the questionnaire will be destroyed. We will record your height and weight at the beginning of the study.

If you choose to participate in our study, you will be asked to:

1. Report your sex, height, weight, and age for our subject demographics.
2. Sit on a chair with your right foot placed on a vibrating probe.
3. Perform two maximum voluntary contractions (MVCs) of the soleus muscle (point toes down) and the tibialis anterior (pull toes up).
4. Have four 1-minute vibrational stimulations applied to the heel while cutaneous reflexes are recorded from your muscles while you contract at 15% of your MVC.
5. Have a heating pad applied to your foot sole and repeat the vibrational stimulation and reflex testing.

Details of protocol requirements:

Vibration Protocol

The vibrating probe is an oscillating tool that applies vibrations to the skin. The perceptual threshold will be tested by increasing the vibrational stimulation until the participant vocalizes that it can be perceived. A vibrational stimulus ten times the perceptual threshold will be used in the experimental trials. The vibrations will be applied at random frequencies between 0 and 50 Hz.

Electromyography (EMG)

The cutaneous reflexes of the lower limb muscles (soleus and tibialis anterior) will be recorded through surface EMG. This involves the placement of electrodes directly on the skin surface. The skin will first be cleaned with alcohol and any hair will be shaved.

Heating

The skin will be heated with a heating pad applied directly to the surface of the foot sole. The temperature of the skin on the foot sole will be continuously recorded to ensure it does not exceed 40°C. This temperature should feel very warm but not painful.

Exclusion Criteria

Participants must be free from lower limb injuries that occurred < 2 years ago, must not have a history of autoimmune disorders (Parkinson's, MS, rheumatoid arthritis, etc.), cardiovascular diseases, neurological disorders, diabetes or a history of severe sleep apnea. Participants must not be taking any form of medication that may reduce their level of skin sensation or have any skin sensitivity to heat. An individual cannot participate in this study if they smoke cigarettes, drink more than 20 alcoholic drinks per week or participate in recreational drug use. Additionally, if a participant has skin conditions such as, rash, atopic dermatitis, or lesions, they will not be permitted to participate in the present study. Lastly, participants are unable to partake in the research during pregnancy.

Potential Risks

You will be seated for the duration of the protocol so there is no risk of losing balance. All experimenters that manipulate the electrodes are required to sterilize their hands with alcohol for the safety of both the subject and the experimenter. The area of the skin will be thoroughly wiped with alcohol before application.

There are no anticipated lasting effects following the vibration. The degree of vibration will be maintained below thresholds perceived as painful. However, it is possible that the vibration stimulus may be uncomfortable or irritating. We encourage you to let us know if you have any sensations of discomfort. There is a small risk that contact of the vibration probes with the subject's foot sole may result in the transfer of bacteria. As a result, all equipment is cleaned with disinfecting wipes before and after each experimental session to eliminate bacterial transfer. The heating of the skin will increase blood flow to the area, causing the skin to potentially turn pink. This change in skin color should reverse as your skin returns to its resting temperature. There is a minor risk that skin could become irritated by the heat. If you express any discomfort, the heat will be removed immediately.

Potential Benefits

There will be no direct benefit by participating in this study. However, participants in the scientific community may be interested in the findings of heating as a potential moderator of motor control.

Payment For Participation

There will be no payment for participating in this study.

Confidentiality

Personal information obtained during this study regarding health history or body measurements will be kept confidential and results that are published will not have identification of participants. **Participant's name and contact may be shared with public health for COVID contact tracing if necessary.** The data will be stored on one lab desktop computer that will be password protected and backed up onto encrypted hard drive and stored in a secure location in Dr. L. Bent's office. Your data files will only be accessible to Leah Bent, Tushar Sharma or Erika Howe. A subject code will be generated to ensure your name will not be attached to the computer data. Any documents generated with your name will be kept in a separate password protected file, only available to the research team listed in this document.

Identified records will be located on Dr. Bent's lab computer and all electronic and hard copies of data will be stored in her locked office at the University of Guelph for 5 years or until data is published (whichever comes first). If you would like to obtain aggregate results of the study upon completion of the study, you can share your contact information at the bottom of this form (email or mailing address) to send along copies of peer-reviewed journal article upon publication.

You are encouraged to ask questions before, during and after the study session.