Non-invasive Brain Stimulation to Improve Quadriceps Muscle Function After Anterior Cruciate Ligament Reconstruction

NCT #: ID not assigned yet

5/28/20

ARCADIA UNIVERSITY
— COMMITTEE ON THE PROTECTION —
OF RESEARCH SUBJECTS

Institutional Review Board (IRB)
Application for Expedited/ Full Board Review

Please fill in all parts of this form that are required. Provide a non-scientific or lay summary of the project that must include the items listed below. The Protocol Summary will be reviewed only if all required sections are completed. **(The spaces provided will expand as you type and will become scroll boxes).** *NOTE: If the protocol is part of a grant, please upload the grant documents (proposal and budget) to the IRBNet package as an appendix.*

1. **Background and Objectives - Describe the purpose of the study. Describe any past studies that are related to this study (short literature review).**

Quadriceps muscle dysfunction persists for years after anterior cruciate ligament reconstruction (ACLR).[9] *Restoring quadriceps function after ACLR is critical as quadriceps performance is related to better self-reported function, reduced risk of reinjury, and better movement patterns.*[4,5,10,12–14] *Emerging evidence suggests that alterations in corticospinal excitability (CSE) persist after ACLR, and these alterations are related to poor quadriceps performance (i.e. less strength and slower rate of torque development (RTD)).*[3,7,18] *However, few studies have evaluated quadriceps performance and CSE prior to 6 months after ACLR.*[7,18] *Comprehensive evaluation of quadriceps performance and CSE early after ACLR is critical to developing new interventions to mitigate persistent quadriceps dysfunction and improve outcomes.*

My previous work indicates that after ACLR patients demonstrate alterations in CSE as early as 2 weeks after surgery,[18] *and these alterations do not change during the course of post-operative rehabilitation (Zarzycki, in review, JOR; Zarzycki, in review, JOSPT). More specifically, patients after ACLR demonstrated reduced thresholds and altered excitability, which suggests that the corticospinal tract has a higher recruitment threshold with potentially steep activation curves. Reduced thresholds and steeper recruitment curves may limit a more graded activation of the quadriceps necessary for functional movement and stability. The fact that the alterations in CSE did not change from 2 weeks after surgery to a mean of 4.5 months after surgery suggests that current rehabilitation strategies are not addressing alterations in CSE. There is a need to investigate new neuromodulatory interventions, such as transcranial direct current stimulation, that have the potential to modify CSE and muscle performance in patients after ACLR.*

Transcranial direct current stimulation (tDCS) increases short-term CSE and isometric strength in healthy participants and stroke surviviors.[6,16,17] *In the proposed pilot study, tDCS will be used as an intervention to determine its effects on CSE and quadriceps muscle performance in patients recovering from ACLR. We will incorporate two measures of quadriceps performance, isometric strength and rate of torque development (RTD) as both measures are altered and related to functional outcomes after ACLR. However, to the best of my knowledge, no studies have determined the effectiveness of tDCS on CSE and quadriceps performance in patients after ACLR, and no studies to date have evaluated the relationship between multiple measures of quadriceps performance and CSE in patients after ACLR. Evaluating new interventions with potential to mitigate alterations in CSE (i.e. active motor thresholds (AMT) and slope of the recruitment curve (SLOPE)) and quadriceps muscle performance (i.e. isometric strength and RTD) in patients recovering from ACLR are critical to improving outcomes in this population. Therefore, the aims of this study are to:*

Aim 1*: Determine the effects of a single session of tDCS on two measures of CSE and two measures of quadriceps performance in patients after ACLR.*
Hypothesis 2.1: Patients after ACLR will demonstrate increased CSE (lower AMTs and steeper SLOPEs) after one session of active tDCS and no changes in CSE after placebo tDCS.
Hypothesis 2.2: Patients after ACLR will demonstrate greater RTD/isometric strength after one session of active tDCS and no changes in RTD/isometric strength after placebo tDCS.

Aim2*: Determine the relationship between two measures of CSE and two measures of quadriceps muscle performance in patients after ACLR.*
Hypothesis 1.1: Greater CSE will be associated with greater quadriceps isometric strength and greater RTD.
Hypothesis 1.2: The correlation between CSE and RTD will be greater than the correlation between CSE and isometric strength.

Current outcomes following ACLR are less than optimal with patients demonstrating chronic quadriceps dysfunction related to altered movement patterns and the development of post-traumatic knee OA. Emerging evidence suggests that quadriceps dysfunction after ACLR is related to alterations in CSE. Therefore, interventions targeting CSE have the

potential to mitigate chronic quadriceps dysfunction, improve movement patterns, and improve outcomes. The proposed study is a logical and essential first step in determining the effect of tDCS, an intervention known to induce changes in excitability, on CSE and quadriceps performance in patients after ACLR. Upon completion of this study, I will have obtained the pilot data needed to apply for a larger grant to investigate the effects of multiple sessions of tDCS on CSE and quadriceps muscle performance, generating the evidence needed to introduce this intervention into the clinical practice.

2. **Data Use (Select all that apply):**
   ☐ Dissertation, Thesis, Undergraduate honors project
   ☒ Publication/journal article, conferences/presentations
   ☐ Results released to agency or organization
   ☒ Results released to participants/parents
   ☐ Results released to employer or school
   ☐ Other Click here to enter text.

3. **External IRB:**
   a) **Is this proposal currently under review or has it been reviewed and approved by another institution's IRB?** IF YES, include a copy of the proposal and if available, IRB approval from that institution. If the proposal has not yet been submitted to the other institution, please note an anticipated date of submission and a copy of the other institution's review guidelines.

      ☐ Yes ☒ No

      Anticipated date of Submission:

   b) **Is this a collaboration with another institution (if yes, please move to section 3 c)?**

      ☐ Yes ☒ No

   c) **Is each institution doing their own review or will one institution serve as the primary IRB through an Authorization Agreement?**
      ☐ Each institution will complete their own review.
      ☐ An Authorization Agreement will be signed.

4. **Study Population - Are the human subjects involved in the proposed activity included in the following categories? (check all that apply, at least one box must be checked)**
   Yes. Human subjects are included in this study.

   ☒Minors
   ☐Prisoners
   ☐ Terminally ill subjects
   ☐ Economically and/or educationally disadvantaged persons
   ☐ None of the above
   ☐ Pregnant women, human fetuses, neonates
   ☐ AIDS/HIV-positive subjects
   ☐ Subjects with intellectual disabilities
   ☐ Minorities
   ☐ Other Click here to enter text.

5. **Inclusion and Exclusion Criteria - Describe the criteria that define who will be included or excluded in your study sample. If you are conducting data analysis only describe what is included in the data set you propose to use.**

ACLR Group: Individuals between the ages of 13 and 55 years with a history of ACLR (4 months to 5 years) will be recruited.

Uninjured Group: Individuals between the ages of 13 and 55 years without a history of major knee injury or surgery will be recruited for the uninjured group. These participants will be matched to participants in the ACLR group by sex, age, and activity level.

Both groups must participate (or participated in prior to surgery) in sports involving jumping, pivoting, cutting on a regular basis to be included. Individuals < 18 years of age will only complete strength testing and questionnaires at one testing session. They will not participate in TMS testing or the intervention (tDCS with stationary bike riding).

Subjects recruited for either group will also be excluded if: (1) they are currently on anti-epileptic medication or have a history of epilepsy or seizures (2) have a first-degree family member with a history of epilepsy (3) had a prior head injury that required hospitalization or concussion in the past 6 months (4) have any metal in the head, eyes, neck or face (with the exception of dentures) (5) have a history of brain surgery (6) have skull abnormalities or fractures (7) have implantation of electrical devices such as (but not limited to) cardiac pacemaker, cardiac defibrillator, cochlear implants or nerve stimulators (8) history or recurring or severe headaches/migraines (9) known neurological disorders or muscle diseases (10) pregnancy (11) lower extremity botulinum injections in past 6 months (12) baclofen pumps (13) taking any medications that act on the central nervous system. Potential participants will be screened verbally of via email for these exclusion criteria prior to consent. At time of consent, the TMS Adult Safety Screen will completed in writing by each potential participant to again screen for these criteria.[15] *Yes answers to questions 1, 3, 5,6,7,8,9,10,12,13 are absolute exclusions. Yes answers to 2,4,11,14,15 will trigger follow up questions. Individuals with a chronic history of syncope, ringing in the ears (yes answer to 2,4) will be excluded. Individuals taking any medications affecting the CNS will be excluded. Individuals with previous adverse reactions to TMS and/or MRI (questions 14,15) will be excluded.*

6. **Number of Participants - Indicate the total number of anticipated participants to be recruited and enrolled.**

Thirty subjects without a history of major knee injury/surgery and 30 subjects with a history of ACLR will be recruited for this study.

7. **Recruitment Method - Describe who will be doing the recruitment of participants. Describe when, where, and how potential participants will be identified and recruited. Describe and attach materials that will be used to recruit participants (attach documents or recruitment script with the application).**

The following recruitment methods will be used for this study.

a. *Two flyers have been created for recruitment (see attached, one flyer for uninjured participants and one for participants after ACLR). These flyers will be posted on bulletin boards at Arcadia University, posted on social media, emailed to students, and emailed to local physical therapists.*
b. *Individuals with a history of ACL reconstruction will be recruited from local physical therapy clinics. Physical therapists will be notified of the study via email and/or phone and asked to have interested participants complete the "consent to contact form". Email/phone scripts are below. Good Sheppard/PENN Partners (GSPP) has a physical therapy clinic on campus. GSPP requires that a specific consent to contact form. Therefore, two consent to contact forms will be attached to this protocol. The physical therapists will only be informing the patients or patients guardians (if under 18 years old) that they may be eligible for a study being conducted at Arcadia University and having the patients/guardians complete the consent to contact form. Patients who complete the consent to contact form will be contacted by the PI who will determine eligibility and explain the study in more detail. Only the PI will be gaining consent with each subject.*

Email script
Dear _____,

My name is Ryan Zarzycki. I am a physical therapist and faculty member in the Physical Therapy Department at Arcadia University. I am running a study to test quadriceps strength and function after ACL reconstruction. For this study, I need to recruit participants without a history of major knee injury and participants with a history of ACL reconstruction. Please have any interested participants complete the "consent to contact form" attached to this email.

Sincerely,
Ryan Zarzycki

Phone script
Hello. My name is Ryan Zarzycki. I am a physical therapist and faculty member in the Physical Therapy Department at Arcadia University. I am running a study to test quadriceps strength and function after ACL reconstruction. For this study, I need to recruit participants without a history of major knee injury and participants with a history of ACL reconstruction. Can you provide me with your email so I can send you additional information regarding the study?

8. Procedures Involved - Describe procedures including:

Procedures
This study will consist of two collections separated by at least 48 hours. Each testing session will take approximately 2.5 hours to complete. All testing procedures will be administered pre and post a session of transcranial direct current stimulation (tDCS). The primary investigator (Ryan Zarzycki) will collect all data. Doctoral students will assist data collection. The PI retains the right to stop testing if he determines that any aspect of the protocol puts the participant at more than minimal risk.

Individuals <18 years old will only complete strength testing and questionnaires at one testing session.

Demographic Data
Each participant will be asked to self-report their leg and hand dominance, describe sport participation, date of birth, age, height, weight, and sex.

Central Nervous System testing
Cortical excitability (via TMS) and cortical activation (via fNIRS) will be evaluated during 2 different tasks: 1) While seated in a dynamometer (strength testing device) and activating their quadriceps muscle at 5% of their maximal torque, and 2) during a single limb stance position. Participants will be secured into a harness system during the single limb stance task to prevent loss of balance. See next 2 sections for specific TMS and fNIRS procedures. Participants < 18 years old will not undergo TMS testing. A separate consent form has been created for participants < 18 years excluding the TMS procedure.

TMS testing
TMS will be delivered using a MagStim 200 Stimulator with a double circular coil (Magstim Ltd, Wales, UK). All TMS testing procedures will be performed for both hemispheres and during both of the tasks mentioned above. Electrical activity from multiple lower extremity muscles will be collected using surface EMG electrodes placed on the skin. One or more of the following muscle groups will be collected: quadriceps, hamstrings, triceps surae. Subjects will wear a closely fitting cap. First, the site on the scalp where a TMS pulse of ~50% maximum stimulator output produces the greatest muscle response (hotspot) will be identified. The active motor threshold

(AMT) will be determined by finding the amount of stimulator output needed to generate at least 5/10 motor evoked potentials that exceed 100 μV. Patients will be activating the target muscle at 5% their MVIC during each pulse by receiving visual feedback of their force. After determining the AMT, 10 pulses at intensities between 80% AMT and 140% AMT (at 10% intervals) will be delivered.

Each time the stimulus intensity is changed, a test stimulus will be triggered away from the participant to ensure the correct intensity and that no noise is present in the EMG signal.

Strength testing

Testing will take place in the Exercise Testing Lab (Room 109, Health Sciences Building). Strength testing will consist of maximal voluntary contractions of the quadriceps muscles of both legs. This testing is performed routinely during physical therapy for individuals with knee pathology. Participants will be seated upright in a dynamometer (HUMAC NORM), a device that secures their pelvis and limbs and resists the patient's attempt to straighten the knee from 90 degrees of knee flexion. The participant will be asked to kick as hard as they can against the arm of the dynamometer to calculate their maximum volitional isometric contraction (MVIC). The amount of force/torque produced will then be recorded. Prior to the MVICs, a series of three sub-maximal practice trials will be performed to familiarize each participant with the task. Three MVICs will then be performed and recorded for analysis. Two additional (one warm up and one test set) sets of five repetitions will be performed to test both quadriceps and hamstring strength through the patients full available range or motion.

Questionnaires

Multiple questionnaires will be administered to examine pain, knee function, emotions and fear of reinjury, and activity level. See appendix B.

Transcranial direct current stimulation (tDCS)

a-tDCS (Soterix 1x1, Soterix Medical Inc, NY, NY) will be delivered over the primary motor cortex contralateral to the surgical limb (i.e. hot spot for the vastus medialis muscle representation found during TMS testing). A pair of carbon electrodes placed in saline-soaked sponges (surface area: 5 x 7 cm^2) will be secured to the scalp using straps (Soterix EASYstrap). The anode will be centered over the hotspot while the cathode will be placed on the right supraorbital area. a-tDCS will be administered while the participant rides a stationary bike for 20 minutes. The bike seat will be adjusted for each participant so that maximal knee flexion range of motion will be 90 degrees. Participants will also be instructed to maintain a neutral ankle angle. Verbal feedback provided by an investigator will be provided throughout the intervention to maintain the neutral ankle position. The standardized seat position and ankle position is to prevent the participant from using their ankle plantarflexors during the pedaling motion. Stationary bike riding was chosen as this task is commonly performed early after ACLR with minimal stress to the healing graft and requires quadriceps activity. The first 5 minutes will serve as a warmup with the patient maintaining a rate of perceived exertion (RPE) of light or 1 out of 10. Over the next 10 minutes, the resistance will be increased to maintain a RPE of moderate or 3/10. The last 5 minutes will serve as a cool down at the same intensity/resistance as the warm up. Active a-tDCS will be applied at an intensity of 2mA with a 30-second ramp-up and 30-second ramp-down for the entire duration of bike riding, while the sham a-tDCS will be applied for only the first 30 seconds.

Data Analysis

Independent t-tests will be used to examine demographic differences between the two groups. A 2 (limb) x 2 (group) ANOVA will be used to evaluate differences in strength, TMS, and fNIRS measures. Regression analyses will be used to determine the relationship between the CNS measures and quadriceps strength, and the relationship between the TMS and fNIRS measures.

9. **Compensation or Credit - Describe the amount and timing of any compensation or credit to participants. Identify the source of the funds to compensate participants**

Each participant (≥18 years of age) will be paid $100 for their participation in this study. Participants must complete both sessions to receive the compensation.

Each participant (<18 years of age) will receive $50 for their participation in this study as they will only complete one session.

10. **Risk to Participants - List the reasonably foreseeable risks, discomforts, or inconveniences related to participation in the research. Consider physical, psychological, social, legal, and economic risks.**

Risks associated with Testing Procedures (TMS, strength testing)

There are no known long term risks of TMS. There is a very small risk of seizure, syncope, and change in auditory thresholds. A recent study examining adverse events of TMS concluded: "Our data suggest that single/paired-pulse and repetitive TMS, conducted within the published guidelines pose a very small increment over the background risks of everyday life to subjects without known risk factors."[8] Screening potential participants for a prior history of seizures, syncope, and hearing impairments will allow us to exclude individuals at increased risk. Participants with be offered ear plugs if the sound from the TMS pulse is uncomfortable.

In the very unlikely event of a seizure, the following steps will be taken: 1) The participant will be positioned in the safest position to maintain an open airway (i.e. laying supine or side lying), 2) emergency personal will be contacted by dialing 911 (research assistant), 3) any objects will be moved away from the participant to prevent additional injury, 4) monitor vitals until emergency personal arrive.

Most subjects report no discomfort from TMS although some do report mild discomfort over the site of stimulation. Some subjects report a mild headache following the procedure. This typically resolves within 24 hours and can be treated with over the counter analgesics (i.e. Tylenol, ibuprofen). If subjects do experience discomfort over the stimulation site, the intensity of the stimulator can be reduced to minimize this. The session will be terminated immediately if the subject reports discomfort that is beyond their tolerance. Subjects may experience mild muscle soreness 24-48 hours after the testing session. This is a normal physiologic response to strength testing and strength training. There are no risks or discomfort associated with strength testing. Strength testing is performed at regular intervals after ACL reconstruction.

Risks associated with transcranial direct current stimulation (tDCS)

TDCS have been used in a growing number of laboratories worldwide since 1985. In the present protocol, only a non-significant risk protocol is being employed by using tDCS. TDCS is very safe and there have been very few incidences of adverse events with tDCS. A recent meta-analysis of adverse effects associated with tDCS reviewed 209 experiments (3836 subjects).[11] The main adverse events were itching, tingling, headache, discomfort, and burning sensation. Poreisz et al summarized findings from 567 sessions involving 102 participants to demonstrate that adverse effects were quite minor in severity.[2] For example, mean ratings of itching during stimulation were 1.6 out of 5. Similar ratings were given for tingling (1.74), burning (1.59), headache (1.4), pain (1.41), difficulties in concentrating (1.73), nervousness (1.0), and unpleasant sensation (1.24). The highest rated adverse effect was fatigue (2.17), although the authors note that this factor was likely influenced by the completion of sometimes monotonous tasks while also receiving tDCS.

There is a strong evidence that tDCS is extremely safe. A recent review reported that "To date, based on over a total 33,000 sessions and over 1000 subjects who received repeated tDCS sessions, there is no evidence for

irreversible injury produced by conventional tDCS protocols within a wide range of stimulation parameters (≤40 min, ≤4 mA, ≤7.2 C)."[1] *In our protocol, the dose of tDCS is significantly below the dose (≤2mA, 20 min) described here. An even more recent systematic review (2018) concluded that "Little evidence was found to suggest that repeated sessions of active tDCS poses increased risk to participants compared to sham tDCS within the limits of parameters used to date."*[11] *However, in case of an unlikely adverse event, we will have appropriate measures to ensure participant safety and comfort. If there is any discomfort during the tDCS procedure, we will double-check our electrodes and machine settings. In case of a headache/neck pain after tDCS, the participant will be advised to take an over-the-counter pain medication. In an unlikely event of skin burn, participant will be referred/ directed to a physician for medical management. Patient and/or his/her medical insurance will pay for the care. This will be made clear in the informed consent.*

We will assess any discomfort or adverse event before, during or after tDCS in patients and age-matched controls. We do not anticipate any major adverse events. Only minor discomfort in less than 5% of subjects undergoing tDCS experience is transient headaches or soreness at the site of stimulation. These side-effects are believed to be due to stimulation of muscles and nerves near the stimulating coil. During and following every tDCS session, we will ask the participant about any incidence of headache. If the participant complains of any discomfort or pain during the tDCS session, the session will be terminated at once. Participants will be informed that if they should feel a tingling sensation below the electrodes. If they feel any other uncomfortable sensation such as burning, they should inform the investigators. If the participant informs us of uncomfortable sensation, we will ensure electrode/machine settings are correct. If the uncomfortable sensation continues, we will stop the procedure.

In order to ensure participant safety following the session, we will use the questionnaire proposed by Brunoni et al. 2011 after each session to record any adverse effects, and follow-up with participants the day after each session if they report scores of 3 (moderate) or 4 (severe) for any of the symptoms or side effects.[2] *Anyone self-reporting a severe effect (4) will be withdrawn from the study.*

Risks associated with stationary bike riding

There is very minimal risk involved with stationary bike riding in our population of athletic individuals. Additionally, stationary bike riding is part of standard physical therapy early (prior to 4 months which is the earliest time that we would recruit a participant) after ACLR. During the intervention (stationary bike with tDCS), participant tolerance will be assessed subjectively (rating of perceived exertion, symptoms) at regular intervals, and the exercise will be terminated if signs or symptoms indicate poor tolerance. In addition, the protocol will include warm-up and cool down phases to minimize the risk of musculoskeletal injury. If required, the participants will be provided with water before, during or after the exercise.

11. Potential Benefits to Participants - Realistically describe the potential benefits that individual participants may experience from taking part in the research. Indicate if there is no direct benefit. Do not include benefits to society or others.

Results of the strength test will be provided to participants in both groups. The results of the strength test will benefit participants in the ACLR group as the findings indicate whether additional strengthening is required and if progression into the next stage of rehabilitation is warranted. The results do not provide any benefits to participants in the uninjured group.

12. **Confidentiality - Describe the following measures to ensure the confidentiality of data: Who will have access to the data? Where and how data will be stored? How long the data will be stored? How and when will data be de-identified?**

    The primary investigator (Ryan Zarzycki), coinvestigator (Shailesh Kantak), and doctoral students working as research assistants will have access to the data. Electronic data will be stored on the hard drive of the computer that runs the HUMAC NORM and a password protected University maintained server only assessable to Dr. Zarzycki. Paper data records will be locked in file cabinets in Dr. Zarzycki's office. All data will be de-identified. A unique two-digit identifier will be randomly assigned to each participant. This code will be utilized on all of the data collection materials. De-identified data will be stored indefinitely.

13. **Consent Process - Describe the process and procedures process you will use to obtain consent. Include a description of: who will be responsible for completing the consent process with participants, where the consent process will take place, how consent will be obtained; and if participants who do not speak English will be enrolled, describe the process to ensure that the oral and/or written information provided to those participants will be in their preferred language. Indicate the language that will be used by those obtaining consent.**

    Consent forms will be used and are attached for review. The PI will obtain consent from all participants.

14. **HIPAA:**
    a) **Is any of the data coming from covered entities* under HIPAA?**

    ☐ Yes ☒ No

    IF YES, please describe:

    b) **Is a data use agreement** required?**

    ☐ Yes ☒ No

    c) **Is a HIPAA Waiver of authorization*** requested?**

    ☐ Yes ☒ No

    *** Covered Entity-** A health plan, a health care clearinghouse, or a health care provider who transmits health information in electronic form in connection with a transaction for which HHS has adopted a standard.

    **** Data Use Agreement-** An agreement into which the covered entity enters with the intended recipient of a limited data set that establishes the ways in which the information in the limited data set may be used and how it will be protected.

    ***** Waiver of Authorization-** The documentation that the covered entity obtains from a researcher or an IRB or a Privacy Board has waived or altered the Privacy Rule's requirement that an individual must authorize a covered entity to use or disclose the individual's PHI for research purposes.

15. **Conflicts of Interest**

a) Do you or any member of your research group, spouses or any dependent children have any interest (i.e. any property of financial interest including stock in the sponsor company, patents, trademarks, copyrights or licensing, supplemental research grants or consulting arrangements) in the test drug/product, device, or research procedure that is the subject of this study that could affect any of the following: the study outcome, data analysis, enrollment of subjects, study design.

☐ Yes ☒ No

IF NO, please move on to section 16.

IF YES, please disclose below and the ways in which the researchers will minimize harm to research subjects and/or the objectivity of research. Please discuss how these conflicts will be managed during the period of the trial. Include language disclosing such interest in the consent form for the use by research subjects.

In addition, for industry-sponsored trials, please attach the documentation submitted to the sponsor as required by 21CFR54.1, if applicable.

b) If related to a grant, have all investigators filed a current annual Significant Financial Interest Form?

☐ Yes ☐ No

c) Among the research team, is there any financial interest that could affect any of the following: the study outcome, data analysis, enrollment of subjects, study design?

☐ Yes ☐ No

IF YES, please describe and disclose in the consent form.

d) Are there any plans for commercial development related to the findings of this study?

☐ Yes ☐ No

IF YES, please describe

e) Will participants financially benefit if the findings are commercialized?

☐ Yes ☐ No

IF YES, please describe

16. **CITI Training- Have the Principal Investigator, Co-PI(s), and faculty advisor (if PI is a student) taken the on-line CITI Course in the Protection of Human Research Subjects? (IF YES, enter dates of certification on IRBNet)**

☒ Yes ☐ No

Ryan Zarzycki (PI) 5/19/20
Shailesh Kantak (co-investigator)

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