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Placebo-induced changes in force production for types of muscle contractions

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Placebo-Induced Changes in Force Production for Types of Muscle Contractions

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PUBLIC PRESENTATION

The public presentation requirement has been waived for all students submitting final projects in Spring 2020.

Dedication

This thesis is dedicated to my parents, Vince and Denene Antonacci, who have provided endless support in all of my academic endeavors.

Acknowledgements

First, I would like to thank Dr. Christopher J. Womack, my faculty advisor. He has engrained in me a significant amount of knowledge about the overall scientific process through his research expertise. In addition, he has allowed me to be independent for a significant amount of the thesis process, so that I could continue to grow in my understanding of data collection. Most importantly, his honest and encouraging mindset truly increased my enjoyment and kept me motivated.

Second, I would like to thank Dr. Luden and Dr. Kurti for providing their feedback on my thesis from its early stages until polishing the final copy. I truly appreciate their straightforward comments and revisions.

Finally, I would like to thank all those who have pushed me to always strive towards excellence in research or life in general. These include my family, Greg Nuckols, and Bruno Ferrari.

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Abstract

Purpose: To test the impact of a placebo drink on acute force production during isometric and isokinetic leg extensions in male and female college students. ***Methods:*** Nine male and five female subjects apparently healthy and free of leg injury completed familiarization testing and two counterbalanced trials. In one trial, participants were told they were consuming a performance-enhancing drink, although the drink contained only flavoring. In the other trial, participants were not given any drink (control). Both trials then included concentric and eccentric strength tests performed at 60 degrees per second, and isometric strength tests with the knee at a 70 degree angle. A repeated-measures analysis of variance (ANOVA) was performed with treatment (placebo, control) and contraction (concentric, eccentric, isometric) as the within-subjects effects. Post-hoc testing was performed using polynomial contrasts. ***Results:*** There was no significant treatment effect for the drink for concentric (132.9 ± 33.8 vs. 130.5 ± 35 Nm), isometric (139.7 ± 36.5 vs. 136.6 ± 28.9 Nm), or eccentric (190.9 ± 50.3 vs. 195.3 ± 55 Nm) quadriceps contractions compared to control, and no treatment x contraction interaction. Eccentric contractions exhibited significantly higher peak torque compared to concentric or isometric contractions ($p < 0.05$). ***Conclusion:*** Findings suggest the placebo effect may not play a significant role in isokinetic or isometric contractions. Findings add to recent, but limited evidence that the placebo effect may not be as universal as currently thought. Future studies should investigate the difference between placebo-induced improvements of isotonic and isokinetic contractions.

Keywords: Placebo effect, isokinetic contractions, expectancy effect, peak torque isokinetic, placebo effect for muscular strength, isokinetic placebo effect.

Chapter I

Introduction

Placebo Effect. The genuine psychological effect that results from receiving a substance or undergoing a procedure with no inherent powers is known as the placebo effect.[1] It has been extensively studied in medicine, including the realms of depression, pain, surgical procedures, and pharmacological testing; however, its contributions to sports performance have not been heavily investigated until the last two decades.[2]

Impact of Placebo on Muscular Strength. Three primary studies have evaluated the effect of a placebo on muscular strength. In a study by Maganaris et al. in 2000, national-level powerlifters gathered baseline one rep max data for the bench press, dead lift, and squat during familiarization trials, which closely resembled competitive conditions. Two experimental trials were performed during the following two weeks. For the first trial, all subjects were given two saccharin pills (described as immediate acting anabolic stimulators) five minutes before retesting the same three lifts. Compared to baseline values for the bench press, deadlift, and squat, the subjects experienced average improvements of 3.5%, 4.2%, and 5.2%, respectfully. Following completion of the first trial, one group of subjects was informed the pills only contained saccharin, and their performance expectedly dropped back to baseline values during the second trial one week later. The group that remained deceived, however, was able to keep their values for the three lifts significantly higher than baseline.[3]

More recently, Kalasountas et al. (2007) found that male and female college non-athletes improved their strength by 10.2% for the machine bench press and 12% for the seated leg press from baseline values after consuming two placebo tablets 8-10 minutes before the first

experimental trial. The subjects were informed that the tablets consisted of strong combinations of amino acids that would produce immediate strength effects.[4]

Dynamic muscle contractions are contractions involving eccentric (lengthening) and concentric (shortening) components, and can be classified as either isotonic (muscle tension is constant) or isokinetic (speed of contraction is constant). Maganaris et al. and Kalasountas et al. used isotonic contractions during their experiments. A study by Tallis et al. in 2016 used isokinetic contractions for maximal strength testing for 14 men. Contraction speeds for knee extension and flexion were tested at both 30 degrees/sec and 120 degrees/sec. For each participant, a familiarization trial was performed, and 4 counterbalanced experimental trials followed: (1) told caffeine, given caffeine; (2) told caffeine, given placebo; (3) told placebo, given placebo; and (4) told placebo, given caffeine. For both contraction speeds, Tallis et al. did not find an additional effect of the expectancy of caffeine.[5]

Placebo Effect and Altered Cortical Activity. Although the precise mechanism regulating placebo-induced strength improvements is unknown, the expectancy theory provides a theoretical basis for understanding those strength responses to the placebo effect. The theory states the expectation for a given effect produces the biological response that underlies the effect by triggering pathways specific to the expectation.[1,6] This is exemplified in patients with Parkinson's disease, in which there was a dose-dependent relationship between the release of dopamine from the motor areas of the striatum and the magnitude of the patients' perceived improvement in muscle control.[7,8] Even small forces of muscular contractions have been shown to induce striatal dopamine release,[9] but limited evidence exists related to the relationship between striatal dopamine release and maximal force production. In addition, in a pain analgesia study, the expectation of decreased pain triggered opioid release from the prefrontal cortical

structures, leading to decreased pain perception.[10] It is unknown whether the opioid release transfers to motor functions, since opioids function mainly in the enteric nervous system.

Muscle Contraction Type and Brain Activity. Interestingly, there are variations in the extent to which motor cortex activity is involved between isometric and dynamic (concentric and eccentric) muscle contractions. EEG, EMG, and fMRI data collection techniques have been used to show differences in motor cortex activity with the different types of contractions.[11-14] Motor cortex activity (i.e. α- and β-band event-related desynchronization) is observed only at the onset of isometric contractions, whereas motor cortex activity appears to be sustained throughout dynamic contractions.[11] This indicates greater excitability of cortical neurons during motor-related brain functions for dynamic contractions.[12] Further, comparing the types of dynamic contractions, greater brain activities in the primary motor cortex have been observed during eccentric contractions compared to concentric contractions by measuring activation volume by fMRI.[13] If brain activity is dependent on the contraction type, the type of contraction may dictate the magnitude of a placebo response by altering the neurological mechanisms responsible.

Summary. To our knowledge, there is no prior research on the impact the placebo effect has between isometric and dynamic contractions. Discovery of variations in the placebo effect between isometric and dynamic contractions would lead to greater importance for controlling for the placebo effect in research studies. Further, if a supplement is tested against a placebo using dynamic contractions rather than isometric contractions, and is shown to be effective, consumers can be more confident in the efficacy of the product. The purpose of the present study is to compare the placebo effect between isometric and isokinetic muscle contractions. It is hypothesized that the placebo effect will be greater for isokinetic contractions compared to isometric contractions.

Chapter II

Methods

Participants. Twenty-four male and female participants will be recruited to voluntarily participate in this investigation. All participants will be apparently healthy and free of lower limb injury for the past 6 months before commencement of the study. Furthermore, participants will not exercise in the 48 hours leading up to testing protocols, and will perform a 10-hour fast preceding testing. Although the participants will not initially be informed of the true nature of the study, they will complete a university-approved informed consent explaining that the consumption of the ergogenic aid does not result in any health risks. Participants will be informed of the actual nature of the study after data collection is completed.

Study Design. Participants will be told they are a part of a pilot study to test the impact of a caffeinated drink on concentric, isometric, and eccentric contractions. Although it will be described as a pilot study, the subjects will be instructed to give maximal effort during all tests. The placebo drink will be described as a supplement that positively impacts strength with minimal psychological effects. Two counterbalanced trials will take place for each participant. In one trial, the participants will consume the placebo drink, and they will perform the strength tests 15 minutes after finishing a caffeine-free, calorie-free drink (bottled water with lemon flavoring). In a second trial, the participants will not consume anything, and they will perform the strength tests 15 minutes after being seated. For a warm-up, 10 repetitions of isokinetic leg extensions at a self-selected resistance not to exceed 50% of perceived capability will be completed 2 minutes before the strength tests. For both trials, concentric, isometric, and eccentric leg extension tests will occur. There will be 6 groups of 4 subjects for the purpose of counterbalancing the order so that every possible sequence of the concentric, isometric, and eccentric tests is given during the

study. Each participant will complete the trials during the same time of day within a week of each other, after completing a familiarization trial.

Strength Test. The strength tests will be performed with the Biodex Isokinetic Dynamometer. Peak torque will be measured for each of the contraction types during 5 repetitions. The concentric and eccentric tests will be performed at 60 degrees per second, while isometric tests will be performed with the knee at a 70 degree angle. Five minutes of rest will be given between each contraction type. The peak torque readings for the trials will not be visible to the participant.

Statistical Analysis. Percentage delta score for placebo effect [(perceived supplement - control condition)/control condition] will be calculated for each type of contraction. A repeated measures analysis of variance (ANOVA) will be performed to compare the delta scores for each type of contraction. Post hoc means comparisons will be performed using paired t-test with a Bonferroni correction. A priori significance will be set at $p < 0.05$.

Chapter III

Manuscript

Introduction

The placebo effect is the genuine psychological effect that results from receiving a substance or undergoing a procedure with no inherent powers.[1] It has been extensively studied in medicine, including the realms of depression, pain, surgical procedures, and pharmacological testing; however, its contributions to sports performance have not been heavily investigated until the last two decades.[2] Studies have shown improved muscular strength following consumption of placebo pills in isotonic exercises – concentric and eccentric exercises that keep a fixed amount of tension in the muscle – such as the bench press and leg extension.[3,4] There has been one study that investigated placebo-induced force changes during isokinetic contractions – a specific type of muscular contraction that maintains movement speed by altering the resistance on the muscle.[5] This study did not observe an impact of a placebo on maximal muscular isokinetic strength. Unpublished findings from our lab indicate a 4.4% improvement in isometric peak force during a leg extension following consumption of a placebo drink.[6]

The expectancy theory generalizes the mechanisms of the placebo effect, stating the expectation for a given effect produces the biological response that underlies the effect by triggering pathways specific to the expectation.[1,7] This is exemplified in Parkinson's Disease patients, in which the magnitude of patients' perceived improvement in muscle control was correlated with the amount of dopamine release from the motor striatum.[8,9] Additionally, the expectation of decreased pain has been shown to trigger opioid release from the prefrontal cortex, leading to decreased pain perception.[10] Further, greater brain activities in the primary motor cortex have been observed during eccentric contractions compared to concentric

contractions, which may allow a greater neurological response to take place following the expectation of improved muscular force.[11] Specifically, the heightened cortical activity could translate into a larger placebo effect. Discovery of variations in the placebo effect between isometric and dynamic muscle contractions would lead to greater importance for controlling for the placebo effect in research studies. The present study evaluated whether a placebo drink affects acute force production of isometric and isokinetic leg extensions.

Methods

Participants. Nine male and five female college age participants were recruited to participate in this investigation (mean ± SD height 174.9 ± 8.9 cm; body mass 75.6 ± 10.8 kg; BMI 24.7 ± 3.1 kg/m^2). All participants were screened using the 2019 Physical Activity Readiness Questionnaire for Everyone (See Appendix B), and were free of lower limb injury for the past six months before commencement of the study. Furthermore, participants did not exercise the leg muscles in the 48 hours leading up to testing protocols, and performed a 10-hour fast preceding testing. Although the participants were not initially informed of the true nature of the study, they completed a university-approved informed consent (See Appendix A), explaining that the consumption of the ergogenic aid does not result in any health risks. Participants were informed of the actual nature of the study after data collection was completed.

Study Design. Participants were told they were part of a pilot study to test the impact of a caffeine-like drink on concentric, isometric, and eccentric contractions. Although it was described as a pilot study, the subjects were instructed to give maximal effort during all tests. The placebo drink was described as a supplement that positively impacts strength with minimal psychological effects. Two counterbalanced trials took place for each participant. In one trial, the participants believed they consumed the supplement, and they performed the strength tests 15

minutes after they finished a non-caffeinated drink (bottled water with non-caloric lemon flavoring). In a second trial, the participants did not consume any drink, and they performed the strength tests 15 minutes after they were seated. For a warm-up, 10 repetitions of isokinetic leg extensions at a self-selected resistance not to exceed 50% of perceived capability were completed 2 minutes before the strength tests. For both trials, concentric, isometric, and eccentric leg extension tests occurred. Test order was counterbalanced so that every possible sequence of the concentric, isometric, and eccentric tests, as well as the order of the placebo drink and no drink, was given during the study. Each participant completed the trials during the same time of day within a week of each other, after completing a familiarization trial.

Strength Test. The strength tests were performed with the Biodex Isokinetic Dynamometer. Peak torque was measured for each of the contraction types during 5 repetitions. The concentric and eccentric tests were performed at 60 degrees per second, while isometric tests were performed with the knee at a 70 degree angle. Five minutes of rest were given between each contraction type. The peak torque readings for the trials were not visible to the participant.

Statistical Analysis. Shapiro-Wilk tests confirmed that all outcome variables were normally distributed. A repeated-measures analysis of variance (ANOVA) was performed with treatment (placebo, control) and contraction (concentric, eccentric, isometric) as the within-subjects effects. Post-hoc testing was performed using polynomial contrasts. A priori significance was set at $p < 0.05$.

Results

Table 1 displays average (± SD) peak torque for each quadriceps contraction type, and the percent improvement for the placebo response to the drink. Eccentric flexion contractions exhibited significantly higher peak torque compared to concentric extension or isometric

contractions ($p < 0.05$). There was no significant treatment effect for the drink ($p > 0.05$). Furthermore, there was no treatment x contraction interaction ($p > 0.05$), suggesting that contraction type did not impact the magnitude of the placebo response in the present sample.

Discussion

The present study examined the effects of a placebo drink on the acute force production changes of isometric and isokinetic leg extensions in male and female college students. To our knowledge, this is the first study comparing the placebo effect between isometric and isokinetic contractions. Contrary to our hypothesis, the primary finding is that the placebo drink did not improve concentric, isometric or eccentric force production. These results contrast with findings of previous literature [2-4,6]; however, the discrepancies may be explained by two main factors, which provide notable insight into the link between expectation and force production for skeletal muscle.

First, isotonic tests were used in previous literature, whereas isokinetic tests were used in the present study. Both Maganaris et al. and Kalasountas et al. observed modest improvements among participants for isotonic compound exercises after consuming placebo pills.[3,4] However, similar to the present study, Tallis et al. did not find a significant increase in maximal force production by a caffeine placebo for isokinetic contractions.[5] Those findings, along with the present study are the only two studies that have examined the placebo effect under isokinetic conditions, and both did not observe a significant placebo effect. Thus, there may be a difference in the effectiveness of a placebo based on the type of muscular contraction. We speculate this may partly be due to the fact that people are more unfamiliar with isokinetic contractions than isotonic contractions. If participants are more focused on the unfamiliarity of a movement, it is possible they would be less focused on the expectancy of the placebo. In the current

investigation, both the drink and the no-drink conditions had significantly higher force production compared to the familiarization trial. This suggests isokinetic contractions may have been unfamiliar to the participants, thereby reducing the placebo effect.

Second, there was a lack of subject-researcher relationship in the present study compared to the previous studies. In a study by Maganaris et al., subjects were national level powerlifters and the researchers were their coaches, so there was a high level of trust that had been developed between the subjects and the researchers.[3] Likewise, Kalasountas et al. and Tallis et al. established authority and trust by recruiting subjects from beginner fitness courses and having degrees in the field.[4,5] In the present study, however, most subjects were the same age and in the same university courses as the investigator administering the placebo drinks and regulating the tests. Thus, there may have been a low level of authority and trust in the efficacy of the drink by the participants. If true, participants would have a low expectation of the placebo effect, thereby reducing the biological mechanisms that underly its effect.[7]

We observed the greatest peak torque for eccentric contractions, but the peak torque for isometric was not greater than that of concentric. This contrasts with current knowledge of isometric contractions producing greater force than concentric contractions.[12] This may be explained by the low number of subjects. More subjects may have resulted in the difference in peak torque between those two types of contractions reaching statistical significance. Additionally, the low number of subjects in the present study may explain the non-significant placebo effect for isometric contractions, which contrast with unpublished findings from our lab.[6] Similar methodologies were used between the previous study and the present study.

Practically, data from the present study suggest the placebo effect is minimal for isokinetic strength tests. Thus, it could help future investigators to know there may be minimal

placebo effect with respect to improvements in peak isokinetic torque or isometric torque assessed on an isokinetic dynamometer. Strengths of the study include the counterbalanced design, and the use of isokinetic dynamometry – a criterion method of assessing muscle strength.[13] The primary limitation of this study is the use of very specific types of contractions that are rarely used outside of research. The isokinetic contractions were performed at a specific speed, so it is unknown if the findings would be similar at different contraction speeds, or if they generalize to isotonic contractions. An additional limitation is the lack of trust and authority between the participants and the researcher, which may have decreased the expectancy effect. Finally, the low sample size in the present study may have contributed to a Type II error for either the main effect of placebo or the placebo x contraction interaction. However, it should be realized that the main effect for placebo and the interaction effect both exhibited small effect sizes (0.13 and 0.001 respectively). Future studies should add additional familiarization trials for isokinetic methods to minimize potential effects due to movement unfamiliarity, include various contraction speeds, and make sure the administer of the placebo drink is one who has authority and trust with participants.

In conclusion, the current investigation did not find a greater placebo effect for dynamic contractions compared to isometric contractions, nor did it find an improvement in force production after consuming the placebo drink. This study adds contradictory evidence to the early placebo effect literature with respect to strength measures. Furthermore, it builds on recent, but limited, evidence that the placebo effect may not play a significant role in isokinetic contractions.

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Table 1. Peak torque (N·m) for the no drink and drink treatments, and the percent improvement of the placebo response.

	No Drink		Drink		% Improvement	
Contraction Type	M	SD	M	SD	M	SD
Concentric Extension	130.5	35	132.9	33.8	3.4	13.8
Isometric	136.6	28.9	139.7	36.5	1.7	10.4
Eccentric Flexion*	195.3	55	190.9	50.3	-1.3	12.4

*Main effect for contraction type (Eccentric Flexion > Isometric, Concentric Extension, $p < 0.05$)

Appendix A

Informed Consent Form

Consent to Participate in Research

Identification of Investigators & Purpose of Study
You are being asked to participate in a research study conducted by Nick Antonacci and Dr. Womack from James Madison University. The purpose of this study is to observe short-term strength responses to a performance supplement. This study will contribute to the completion of Nick Antonacci's Honors Thesis.

Research Procedures
Should you decide to participate in this research study, you will be asked to sign this consent form once all your questions have been answered to your satisfaction. This study consists of three visits to the Human Performance Laboratory in Godwin Hall, Room 209. The first visit will be a familiarization trial, in which you will get used to the Biodex machine (the leg strength testing machine we will be using). The second and third visits will consists of 3 different maximal effort single-leg extensions after consuming either a performance supplement or nothing at all. Prior to the second and third visit, you will be asked to refrain from eating or drinking anything except water for 10 hours prior to the test (ex: no food/drink after 10pm if the test is at 8am the next day).

Time Required
Participation in this study will require 70 minutes of your time over the course of 3 weeks. The first session will take 10 minutes, while the last two sessions will take approximately 30 minutes each.

Risks
The investigator perceives the following are possible risks arising from your involvement with this study. Mild discomfort associated with maximal exertion of leg muscles. Research has shown that the rate of injury of strength training ranges between 0.24 – 5.5 injuries per 1000 hours of training. Given that the involvement in our study is only 70 minutes and the leg extension is a safe, single-joint exercise, the risk of injury is even lower. In the highly unlikely event of a cardiac arrest, at least 1 CPR-trained investigator will be present at every test.

Benefits
Potential benefits from participation in this study include feedback on your current level of single-leg peak torque (an indicator of lower limb strength), and knowledge of how your body responds to short-term performance enhancing supplements.

Confidentiality
The results of this research will be presented at JMU conferences and may appear in online research journals. The results of this project will be coded in such a way that the respondent's identity will not be attached to the final form of this study. The researchers retain the right to use and publish non-identifiable data. While individual responses are confidential, aggregate data will be presented representing averages or generalizations about the responses as a whole. All data will be stored in a secure location accessible only to the researcher. Upon completion of the study, all information that matches up individual respondents with their answers will be destroyed.

Participation & Withdrawal
Your participation is entirely voluntary. You are free to choose not to participate. Should you choose to participate, you can withdraw at any time without consequences of any kind.

Questions about the Study
If you have questions or concerns during the time of your participation in this study, or after its completion or you would like to receive a copy of the final aggregate results of this study, please contact:

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Questions about Your Rights as a Research Subject
Dr. Taimi Castle
Chair, Institutional Review Board
James Madison University
(540) 568-5929
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Giving of Consent
I have read this consent form and I understand what is being requested of me as a participant in this study. I freely consent to participate. I have been given satisfactory answers to my questions. The investigator provided me with a copy of this form. I certify that I am at least 18 years of age.

_____
Name of Participant (Printed)

_____ _____
Name of Participant (Signed) Date

_____ _____
Name of Researcher (Signed) Date

Appendix B

2019 PAR-Q+

2019 PAR-Q+

The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor OR a qualified exercise professional before becoming more physically active.

GENERAL HEALTH QUESTIONS

Please read the 7 questions below carefully and answer each one honestly: check YES or NO.	YES	NO
1) Has your doctor ever said that you have a heart condition ☐ OR high blood pressure ☐?	☐	☐
2) Do you feel pain in your chest at rest, during your daily activities of living, **OR** when you do physical activity?	☐	☐
3) Do you lose balance because of dizziness **OR** have you lost consciousness in the last 12 months? Please answer **NO** if your dizziness was associated with over-breathing (including during vigorous exercise).	☐	☐
4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? **PLEASE LIST CONDITION(S) HERE:** _____	☐	☐
5) Are you currently taking prescribed medications for a chronic medical condition? **PLEASE LIST CONDITION(S) AND MEDICATIONS HERE:** _____	☐	☐
6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Please answer **NO** if you had a problem in the past, but it **does not limit your current ability** to be physically active. **PLEASE LIST CONDITION(S) HERE:** _____	☐	☐
7) Has your doctor ever said that you should only do medically supervised physical activity?	☐	☐

If you answered NO to all of the questions above, you are cleared for physical activity.
Please sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.

- Start becoming much more physically active – start slowly and build up gradually.
- Follow International Physical Activity Guidelines for your age (www.who.int/dietphysicalactivity/en/).
- You may take part in a health and fitness appraisal.
- If you are over the age of 45 yr and NOT accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.
- If you have any further questions, contact a qualified exercise professional.

PARTICIPANT DECLARATION

If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for its records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME _____ DATE _____

SIGNATURE _____ WITNESS _____

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER _____

If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.

Delay becoming more active if:

- You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at **www.eparmedx.com** before becoming more physically active.
- Your health changes - answer the questions on Pages 2 and 3 of this document and/or talk to your doctor or a qualified exercise professional before continuing with any physical activity program.

11-01-2018

2019 PAR-Q+

FOLLOW-UP QUESTIONS ABOUT YOUR MEDICAL CONDITION(S)

1. Do you have Arthritis, Osteoporosis, or Back Problems?

If the above condition(s) is/are present, answer questions 1a-1c — If **NO** ☐ go to question 2

1a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
1b.	Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)?	YES ☐ NO ☐
1c.	Have you had steroid injections or taken steroid tablets regularly for more than 3 months?	YES ☐ NO ☐

2. Do you currently have Cancer of any kind?

If the above condition(s) is/are present, answer questions 2a-2b — If **NO** ☐ go to question 3

2a.	Does your cancer diagnosis include any of the following types: lung/bronchogenic, multiple myeloma (cancer of plasma cells), head, and/or neck?	YES ☐ NO ☐
2b.	Are you currently receiving cancer therapy (such as chemotheraphy or radiotherapy)?	YES ☐ NO ☐

3. Do you have a Heart or Cardiovascular Condition? This includes Coronary Artery Disease, Heart Failure, Diagnosed Abnormality of Heart Rhythm

If the above condition(s) is/are present, answer questions 3a-3d — If **NO** ☐ go to question 4

3a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
3b.	Do you have an irregular heart beat that requires medical management? (e.g., atrial fibrillation, premature ventricular contraction)	YES ☐ NO ☐
3c.	Do you have chronic heart failure?	YES ☐ NO ☐
3d.	Do you have diagnosed coronary artery (cardiovascular) disease and have not participated in regular physical activity in the last 2 months?	YES ☐ NO ☐

4. Do you have High Blood Pressure?

If the above condition(s) is/are present, answer questions 4a-4b — If **NO** ☐ go to question 5

4a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
4b.	Do you have a resting blood pressure equal to or greater than 160/90 mmHg with or without medication? (Answer **YES** if you do not know your resting blood pressure)	YES ☐ NO ☐

5. Do you have any Metabolic Conditions? This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes

If the above condition(s) is/are present, answer questions 5a-5e — If **NO** ☐ go to question 6

5a.	Do you often have difficulty controlling your blood sugar levels with foods, medications, or other physician-prescribed therapies?	YES ☐ NO ☐
5b.	Do you often suffer from signs and symptoms of low blood sugar (hypoglycemia) following exercise and/or during activities of daily living? Signs of hypoglycemia may include shakiness, nervousness, unusual irritability, abnormal sweating, dizziness or light-headedness, mental confusion, difficulty speaking, weakness, or sleepiness.	YES ☐ NO ☐
5c.	Do you have any signs or symptoms of diabetes complications such as heart or vascular disease and/or complications affecting your eyes, kidneys, **OR** the sensation in your toes and feet?	YES ☐ NO ☐
5d.	Do you have other metabolic conditions (such as current pregnancy-related diabetes, chronic kidney disease, or liver problems)?	YES ☐ NO ☐
5e.	Are you planning to engage in what for you is unusually high (or vigorous) intensity exercise in the near future?	YES ☐ NO ☐

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6. Do you have any Mental Health Problems or Learning Difficulties? This includes Alzheimer's, Dementia, Depression, Anxiety Disorder, Eating Disorder, Psychotic Disorder, Intellectual Disability, Down Syndrome

If the above condition(s) is/are present, answer questions 6a-6b If **NO** ☐ go to question 7

6a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
6b.	Do you have Down Syndrome **AND** back problems affecting nerves or muscles?	YES ☐ NO ☐

7. Do you have a Respiratory Disease? This includes Chronic Obstructive Pulmonary Disease, Asthma, Pulmonary High Blood Pressure

If the above condition(s) is/are present, answer questions 7a-7d If **NO** ☐ go to question 8

7a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
7b.	Has your doctor ever said your blood oxygen level is low at rest or during exercise and/or that you require supplemental oxygen therapy?	YES ☐ NO ☐
7c.	If asthmatic, do you currently have symptoms of chest tightness, wheezing, laboured breathing, consistent cough (more than 2 days/week), or have you used your rescue medication more than twice in the last week?	YES ☐ NO ☐
7d.	Has your doctor ever said you have high blood pressure in the blood vessels of your lungs?	YES ☐ NO ☐

8. Do you have a Spinal Cord Injury? This includes Tetraplegia and Paraplegia

If the above condition(s) is/are present, answer questions 8a-8c If **NO** ☐ go to question 9

8a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
8b.	Do you commonly exhibit low resting blood pressure significant enough to cause dizziness, light-headedness, and/or fainting?	YES ☐ NO ☐
8c.	Has your physician indicated that you exhibit sudden bouts of high blood pressure (known as Autonomic Dysreflexia)?	YES ☐ NO ☐

9. Have you had a Stroke? This includes Transient Ischemic Attack (TIA) or Cerebrovascular Event

If the above condition(s) is/are present, answer questions 9a-9c If **NO** ☐ go to question 10

9a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer NO if you are not currently taking medications or other treatments)	YES ☐ NO ☐
9b.	Do you have any impairment in walking or mobility?	YES ☐ NO ☐
9c.	Have you experienced a stroke or impairment in nerves or muscles in the past 6 months?	YES ☐ NO ☐

10. Do you have any other medical condition not listed above or do you have two or more medical conditions?

If you have other medical conditions, answer questions 10a-10c If **NO** ☐ read the Page 4 recommendations

10a.	Have you experienced a blackout, fainted, or lost consciousness as a result of a head injury within the last 12 months **OR** have you had a diagnosed concussion within the last 12 months?	YES ☐ NO ☐
10b.	Do you have a medical condition that is not listed (such as epilepsy, neurological conditions, kidney problems)?	YES ☐ NO ☐
10c.	Do you currently live with two or more medical conditions?	YES ☐ NO ☐

PLEASE LIST YOUR MEDICAL CONDITION(S) AND ANY RELATED MEDICATIONS HERE: _____

_____

GO to Page 4 for recommendations about your current medical condition(s) and sign the PARTICIPANT DECLARATION.

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If you answered NO to all of the FOLLOW-UP questions (pgs. 2-3) about your medical condition, you are ready to become more physically active - sign the PARTICIPANT DECLARATION below:

- It is advised that you consult a qualified exercise professional to help you develop a safe and effective physical activity plan to meet your health needs.
- You are encouraged to start slowly and build up gradually - 20 to 60 minutes of low to moderate intensity exercise, 3-5 days per week including aerobic and muscle strengthening exercises.
- As you progress, you should aim to accumulate 150 minutes or more of moderate intensity physical activity per week.
- If you are over the age of 45 yr and **NOT** accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.

If you answered **YES** to **one or more of the follow-up questions** about your medical condition:

You should seek further information before becoming more physically active or engaging in a fitness appraisal. You should complete the specially designed online screening and exercise recommendations program - the **ePARmed-X+ at www.eparmedx.com** and/or visit a qualified exercise professional to work through the ePARmed-X+ and for further information.

Delay becoming more active if:

- You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ **at www.eparmedx.com** before becoming more physically active.
- Your health changes - talk to your doctor or qualified exercise professional before continuing with any physical activity program.

- You are encouraged to photocopy the PAR-Q+. You must use the entire questionnaire and NO changes are permitted.
- The authors, the PAR-Q+ Collaboration, partner organizations, and their agents assume no liability for persons who undertake physical activity and/or make use of the PAR-Q+ or ePARmed-X+. If in doubt after completing the questionnaire, consult your doctor prior to physical activity.

PARTICIPANT DECLARATION

- All persons who have completed the PAR-Q+ please read and sign the declaration below.
- If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME _____ DATE _____

SIGNATURE _____ WITNESS _____

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER _____

For more information, please contact

www.eparmedx.com
Email: eparmedx@gmail.com

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Appendix C

Debriefing Script

Debriefing Script

Thank you for participating in our caffeine study. I would like to explain to you more about exactly what we were trying to study. Sometimes the scientific process requires that the participants in research studies are not given complete information about the nature of the study until after the study is completed. If we tell people the true purpose of a study, it may influence their performance in the study.

In our study, we wanted to test the placebo effect for various types of leg contractions. The placebo effect is the psychological effect that results from believing a substance or procedure will have an impact, even though it has no inherent powers. When you were told you were consuming caffeine, it was truly flavored water. You never consumed caffeine during the study. This way, we were able to see if your force production was affected by your belief of improving performance.

Now that the study has been explained, do you allow us to use the data from your participation?

If you have any other questions later feel free to contact us*

*Names and phone numbers for Principal Investigator and Faculty Advisor will be provided.

Thanks again for your participation!

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