NSCA®
NATIONAL STRENGTH AND CONDITIONING ASSOCIATION

2023 NSCA National Conference Research Abstract Submission & Presentation Guidelines

Updated October 18, 2022

THE NATIONAL STRENGTH AND CONDITIONING ASSOCIATION® (NSCA®)

The National Strength and Conditioning Association (NSCA) is a nonprofit professional organization dedicated to advancing the strength and conditioning profession around the world.

Mission statement: As the worldwide authority on strength and conditioning, we support and disseminate research based knowledge and its practical application, to improve athletic performance and fitness

The NSCA advances the profession by supporting strength and conditioning professionals devoted to helping others discover and maximize their strengths. We disseminate research-based knowledge and its practical application by offering industry-leading certifications, research journals, career development services, and continuing education opportunities. The NSCA community is composed of more than 45,000 members and certified professionals who further industry standards as researchers, educators, strength coaches, personal trainers, and other roles in related fields.

GENERAL INFORMATION

The National Strength and Conditioning Association (NSCA) is pleased to make a call for research abstract submissions for presentation at the 2023 National Conference. Research abstract presentations are an opportunity to present current research findings to researchers and strength and conditioning professionals at the NSCA National Conference. The research abstracts are the largest portion of the scientific programs presented every year at the National Conference. The NSCA encourages all researchers and students to submit their abstracts for consideration to the 2023 National Conference.

SUBMISSION DEADLINE

The abstract submission deadline is March 1, 2023 (11:59 PM Eastern Time). Late submissions will not be accepted.

NOTIFICATION

Submitting authors will receive notification of acceptance or rejection of their research abstract by May 1, 2023. If you do not receive notification by May 1, please contact abstracts@nsca.com.

LANGUAGE

All abstracts must be written in English.

COST

There is no cost to submit an abstract, but due to costs incurred by the NSCA, all accepted abstracts are expected to be presented.

FAILURE TO PRESENT

Failure to present an accepted abstract may result in disqualification from presentations at future NSCA conferences.

PRESENTATION FORMAT

Research abstracts can be presented in either a podium or poster. Due to a limited number of available podium presentations, all requests for podium presentations cannot be accommodated. If an abstracted submitted for a podium presentation is not accepted for that format, it will automatically be assigned to a poster presentation.

PRESENTATION DATES

Podium and poster presentations occur on all three days of the conference (July 13 – 15, 2023). Podium presentations typically occur in the morning with poster presentations occurring in two blocks each day.

PUBLICATION OF ABSTRACTS

Accepted abstracts, that are presented, will be published in an electronic supplement to the *Journal of Strength and Conditioning Research* (date to be determined). The NSCA encourages all research abstract presenters to submit the completed manuscript of their presented research for consideration in the *Journal of Strength and Conditioning Research*.

RESEARCH ABSTRACT SUBMISSION GUIDELINES

- Abstracts must be original research studies that are unpublished.
- Abstracts may not have been previously presented (except at an NSCA regional or state conference).
- All data collection must be completed at the time of submission. Incomplete data collection will not be accepted.
- Do not submit abstracts containing data currently in press. In the event that data contained in an accepted abstract is published (paper, electronic, or other format) prior to the abstract's submission to the National Conference, the abstract will be withdrawn.
- Case studies (involving clinical cases, rare circumstances, adverse events, etc.) will only be considered on an individual basis.
- Sample size should be sufficient to draw meaningful conclusions based on primary statistical analyses used.
- The first author of the research abstract is considered the *primary author* and must present the abstract. However, all authors must approve the abstract prior to submission.
- One person may be the primary author on a maximum of two abstracts (only one may be submitted as a podium presentation).
- The number of authors for each abstract is limited to ten (10). An author is defined as an individual identified by the research group to have made substantial contributions to the reported work and agrees to be accountable for these contributions.
- All abstract presenters must pay for their conference registration and all other fees associated with travel.
- Abstracts may only be submitted online.
- For questions, please email the NSCA at abstracts@nsca.com.

SUBJECT CATEGORIES

There are twelve (12) available categories for research abstracts:

1. Biochemistry / Endocrinology
2. Biomechanics / Neuromuscular
3. Body Composition
4. Endurance Training / Cardiorespiratory
5. Fitness / Health
6. Flexibility / Stretching
7. Nutrition / Ergogenic Aids
8. Resistance Training / Periodization
9. Social and Behavioral Science
10. Special Populations (health conditions)
11. Speed / Power Development
12. Tactical Strength and Conditioning

USE OF HUMAN AND ANIMAL SUBJECTS

All research studies that include data recorded from human participants must comply with the Declaration of Helsinki and the US Department of Health and Human Services Policy for the Protection of Human Research Subjects (US

Code, Title 45, Part 46 Protection of Human Subjects). All animal studies must comply with the Public Health Service Policy on Humane Care and Use of Laboratory Animals.

ABSTRACT FORMATTING SPECIFICATIONS

- All abstract submissions must be formatted correctly (see examples below) and include original research-based data to allow for a thorough review. Abstracts that do not meet these criteria will not be accepted.
- The body of the abstract cannot exceed 3,500 characters (including spaces) when there is no figure or table included. When there is a figure or table associated with the abstract, the text cannot exceed 3,000 characters (including spaces).

FIGURES AND TABLES

- Abstracts may contain either one figure or one table, but not both. Abstracts submitted with more than one figure or table will have both images removed.
- Any figure or table must pertain to the abstract for the purpose of visualizing data and must be referred to in the text of the abstract. Figures or tables that do not pertain to the abstract will be removed.
- Figures or tables must be concise. It is at the discretion of the NSCA if a figure or table is too big, and if so, it will be removed. Additional text that should be in the abstract may not be substituted in the figure or table.
- The resolution of the figure or table must be adequate for reprinting (i.e., = 150 dpi).
- Including a figure or table does not replace any of the required sections (i.e., purpose, methods, results, etc.).
- No photos or pictures are allowed – only a figure or a table.
- The figure or table must be an image file (.jpg, .gif, and .png are accepted). PDF and PowerPoint are not acceptable.

REQUIRED INFORMATION

- Abstracts/submissions must contain the following:
  - Long title (in ALL CAPS) cannot exceed 150 characters (including spaces).
  - Short title cannot exceed 10 words.
  - Language: English.
  - Abstracts must contain the following labeled sections: PURPOSE, METHODS, RESULTS, CONCLUSIONS, and PRACTICAL APPLICATIONS. These section labels must appear in all capital letters on the abstract.
  - Acknowledgements should be included to denote funding sources and/or conflicts of interest when applicable.
- Abstracts/submissions cannot contain the following:
  - Advertising. Research abstracts should be non-biased, free from solicitations, and should not contain demonstrations of products for the purpose of sales.
  - Author(s) degrees (MS, PhD, etc.) or credentials (CSCS, FNSCA, etc.).
- The following information will be asked during the submission process:
  - All authors' names.
    - If the primary/presenting author is submitting for award consideration, they must be an NSCA Member (professional or student).
    - If an author is NSCA certified, their NSCA ID Number must be entered to automatically record NSCA CEUs. If the authors NSCA ID Number is not entered, the author must self-report the CEUs.
  - All authors' primary institutions/laboratories (institution/laboratory name, city, state).
  - All authors' professional mailing address, email address, and phone number.

- Desired presentation format (i.e., podium or poster).
  - Due to limited availability, not all podium requests can be accommodated.
- Abstract subject category.
- If the abstract is being considered for a Student Research Award (see below).

BRAND NAMES

- Brand names may only be used in the METHODS section to describe testing procedures when necessary and/or in the ACKNOWLEDGEMENTS section to describe funding or disclose any financial relationships.
- Brand names cannot appear in the title (short or long).
- Brand names may not be used for promotional purposes. It is at the discretion of the NSCA to determine if the use of the brand name is for descriptive or promotional purposes.
- The NSCA reserves the right to replace any brand name with a generic name without notice.

EXAMPLE ABSTRACT WITH FIGURE OR TABLE

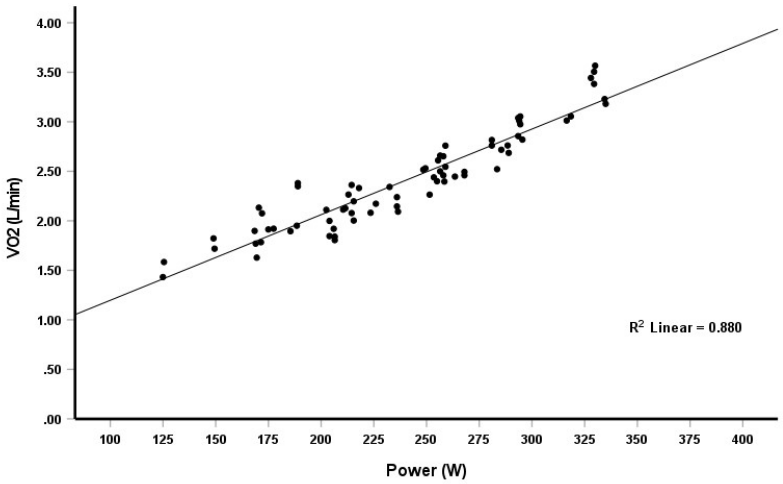
Concurrent Validity and Inter-Device Reliability of a Commercial Running Power Meter in Recreational Runners

J. Hudgins[1], I. Gillis[1], J. Pastina[1], M. Abel[1], H. Bergstrom[1], W. Black[2], S. Best[1]

[1]University of Kentucky, [2]Owensboro Health

Recent development of running power (P_W) meters has provided endurance runners and coaches with a novel measure of running intensity. Despite support for strong validity and repeatability in well-trained runners, the validity of running power as a measure of metabolic workload in recreational runners has not yet been determined. **PURPOSE:** The purpose of this study was to determine if changes in P_W calculated by a commercial running power meter accurately reflect changes in metabolic workload during running. **METHODS:** Nine male recreational runners completed the study (age: 28.4±7.4 yr, body mass: 74.7±7.4 kg, height: 180.8±8.1 cm, VO_2max: 55.8±7.0 ml/kg/min). All participants completed a 10km run in < 50 minutes in the previous 6 months. On two separate days participants completed a four-stage submaximal treadmill running test (5 min. each at 5, 6, 7, and 8 mi/hr; respiratory exchange ratio < 1.0 at all speeds for all runners) and a maximal graded running test to volitional exhaustion. P_W was recorded by commercial running power meters (Stryd with Wind, Stryd Inc., Boulder, CO). To assess inter-device reliability, one power meter was attached to the right shoe and one to the left during all testing. VO_2 (via expired gas analysis), heart rate (HR), and rating of perceived exertion (RPE) were recorded throughout all tests. P_W from each device (left and right power meters) across submaximal velocities was used to calculate the intraclass correlation coefficient (ICC 2,1) as well as the standard error of measurement (SEM) in absolute terms (Watts, W) and as a coefficient of variation (CV=100 x (SEM/mean)). The minimal difference (MD=SEM x 1.96 x √2) was also determined. A linear regression analysis determined the relationship between P_W and VO_2. Paired t-Tests determined any differences between devices for P_W, and between trials for P_W, VO_2, HR, and RPE. **RESULTS:** There was a strong positive relationship between the average device P_W and VO_2 (Figure 1, r=0.938, p< 0.001). The P_W meters showed near-perfect inter-device reliability (ICC=0.999, SEM=1.69 W, CV=0.71%). A significant difference in mean power of 1.00-1.89 W was found between devices at each velocity (5mph, p=0.046; 6mph, p=0.005; 7mph, p=0.008; 8mph, p=0.012). However, this difference is not practically significant, as no participants' between-device P_W differed more than the MD of 4.7W. No significant differences were found between trials for all other measures (p≥0.311). **CONCLUSIONS:** The strong linear relationship between P_W and VO_2 indicates P_w calculated by the P_W meter accurately reflects differences in metabolic workload during submaximal exercise in recreational runners. P_W was also found to be reliable, and small inter-device differences in P_w were less than the standard error of measurement and/or the minimal difference. **PRACTICAL APPLICATION:** These data suggest runners and coaches can use P_w to validly and reliably indicate metabolic demand at endurance running velocities.

Figure 1.



Oxygen consumption (L/min) vs. Pw (W) across all velocities of the submaximal running tests.

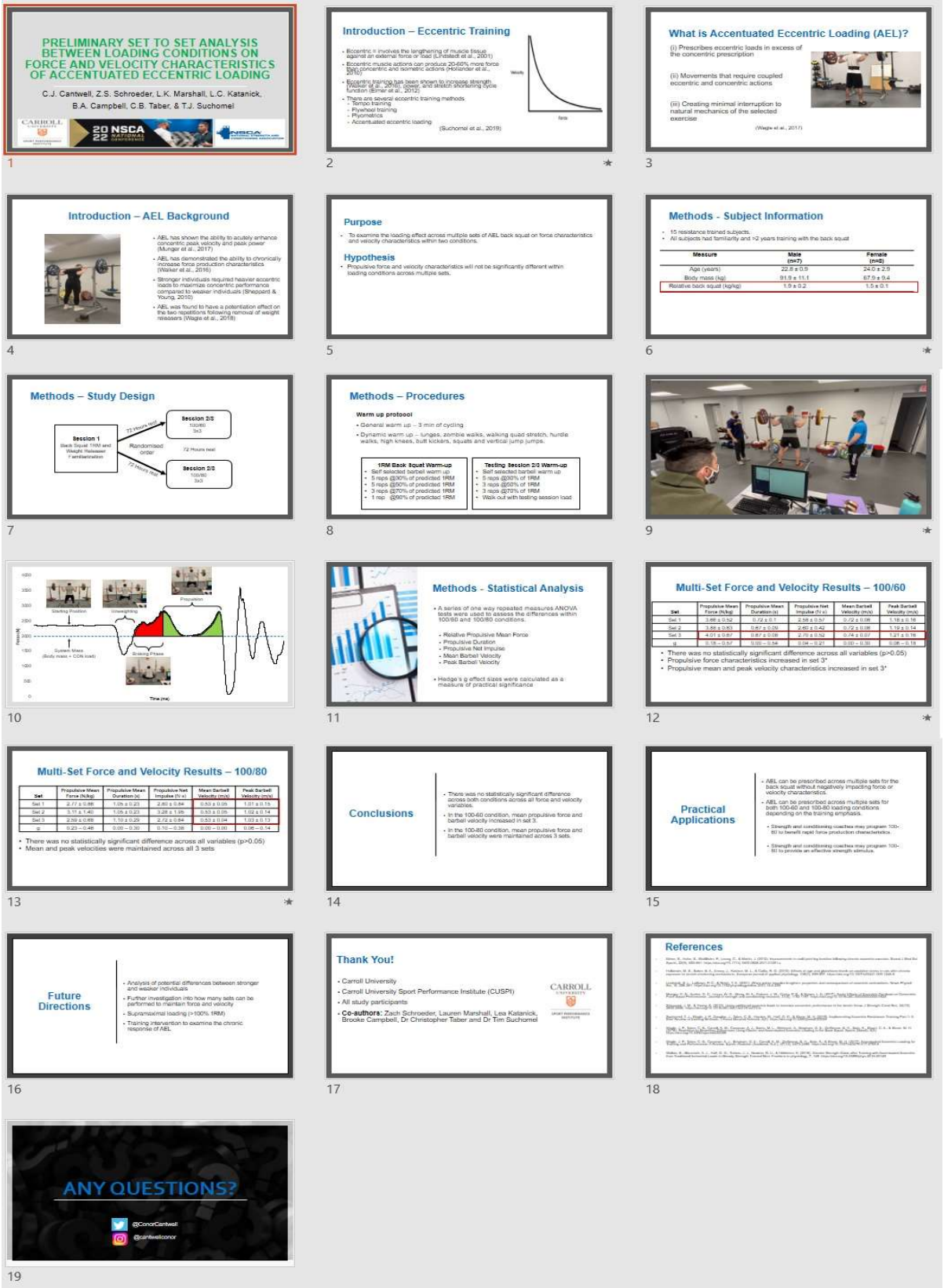
PODIUM ABSTRACT PRESENTATION GUIDELINES

- All podium abstract presentations must be prepared in Microsoft PowerPoint.
- All presenters are required to upload their presentation to an NSCA Dropbox account by July 10, 2023 (11:59 PM Eastern Time). Dropbox account URL to be provided.
- Presenters should bring a back-up copy of their presentation on a USB drive.
- All presenters should check in with their session's moderator prior to presenting.
    - Moderators are assigned in 1-hour blocks (9:00 – 10:00 AM, 10:00 – 11:00 AM, etc.). Podium presenters should check-in with their moderator before the hour block of their presentation.
- Podium abstract presentations must be consistent with the contents of the accepted abstract, and include the following sections: purpose, methods, results, conclusions, and practical applications.
- Podium presentations are 10 – 12 minutes in duration with 3 – 5 minutes of questions from the audience and responses from the presenter.

EXAMPLE PODIUM PRESENTATION

2022 Master's Student Outstanding Podium Presentation

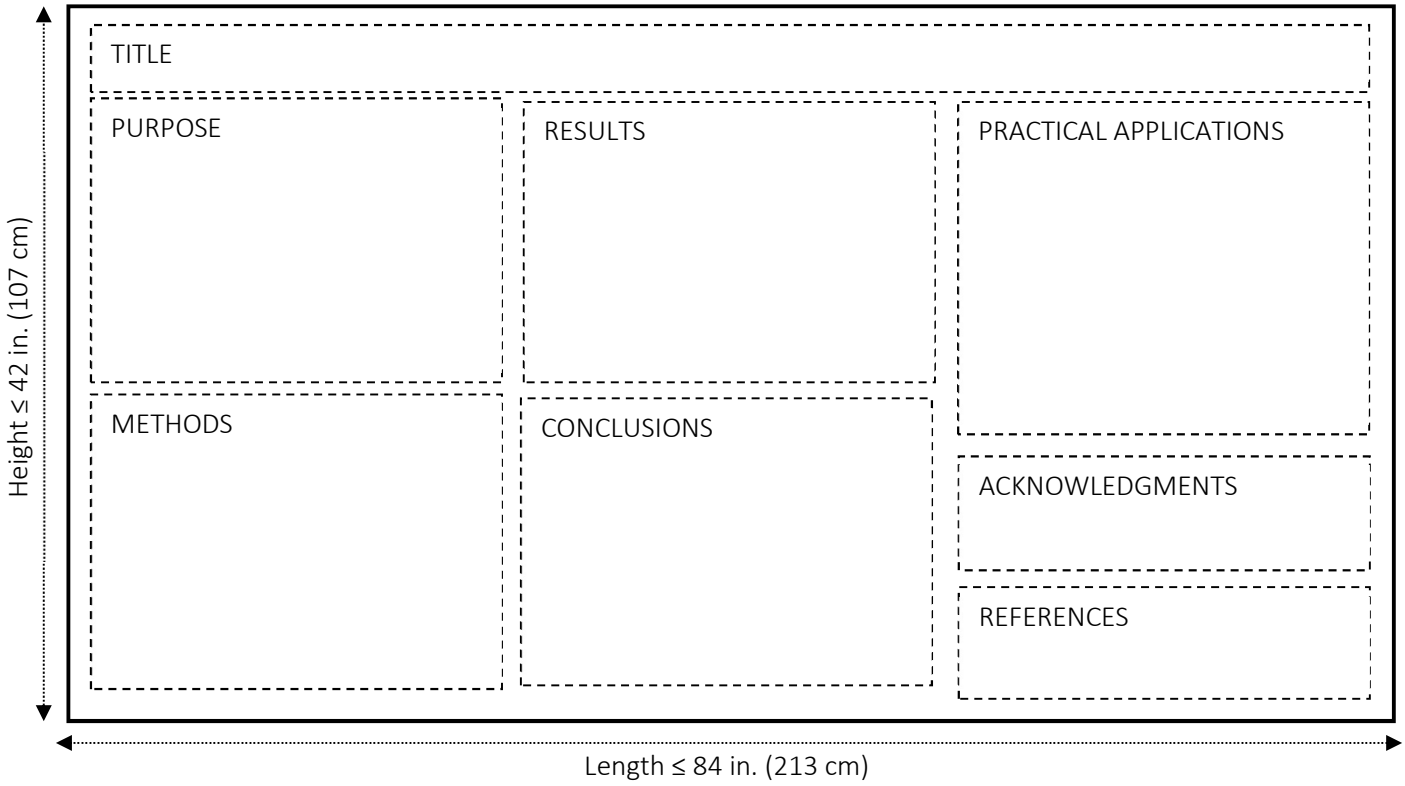
Conor Cantwell Chandler – Carroll University



POSTER ABSTRACT PRESENTATION GUIDELINES

- All poster presentations should be printed on one uniform poster sheet with dimensions not exceeding 42 × 84 inches (107 × 213 centimeters) (height × width). Unless otherwise noted, the poster boards on which the posters are hung should be 48 × 96 in. (122 × 244 cm).
- Poster abstract presentations abstract presentations must be consistent with the contents of the accepted abstract, and include the following sections: purpose, methods, results, conclusions, and practical applications.
- The Research Committee recommends one of the two following layouts (Traditional Poster or #betterposter) as a general guideline for all poster presentations:

I. TRADITIONAL POSTER DESIGN



EXAMPLE OF TRADITIONAL POSTER PRESENTATION

2022 Undergraduate Student Outstanding Poster Presentation Winner

Elise Choquette – Creighton University

Creighton UNIVERSITY
College of Arts and Sciences
Department of Exercise Science and Pre-Health Professions

EFFECT OF A FATIGUING PROTOCOL ON MAXIMAL AND RAPID FORCE PRODUCTION IN PERSONS WITH PARKINSON'S DISEASE AND OLDER ADULTS

Elise Choquette, Mitchel A. Magrini, Mae Grahek, Jacob Siedlik, Kelley G. Hammond
Creighton University

Introduction

Persons with Parkinson's Disease (PD) experience neuromuscular disruption leading to resting tremor and bradykinesia (Figure 1). In comparison to non-impaired older adults (OA), they may exhibit a difference in muscle activation while performing maximal contractions[1-3].

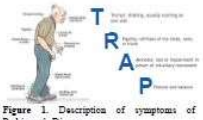


Figure 1. Description of symptoms of Parkinson's Disease

Individuals with PD exhibit fatigue resistance across repeated contractions[4-5], which could be due to substantial type-1 motor unit reorganization compared to age-matched OA[3]. Because of the potential shift in fiber type, peak torque and rate of torque development may be reduced in PD compared to OA[6]. Further, fatigue resistance may be observed in the PD compared to the OA.

The purpose of this study was to determine the effect of a fatiguing isometric knee extension protocol on maximal force and rapid force production in persons with PD and non-impaired older adults.

Methods

Twenty individuals (PD=11, OA=9) volunteered for this study. Following a warm-up and familiarization, participants performed two maximal isometric Contractions (MVIC) of the knee extensors. Following a recovery period, participants completed a fatiguing protocol that consisted of 5-sec maximal isometric voluntary contractions of the quadriceps femoris with 5-sec rest for a total of 30 contractions. During this fatiguing protocol, participants were instructed to push their leg against the cuff (activating their quadriceps muscles) as hard and as fast as they could.


Figure 2. Illustration of the Biodex and EMG placement

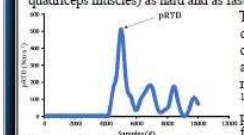


Figure 3. pRTD from first order derivative torque signal

The highest torque (Nm) achieved during the first, middle, and last contraction was calculated and defined as peak torque (PT). Additionally, peak rate of force development (pRFD; Nm/s^{-1}) was assessed as the highest positive peak using the first derivative of the force signal and determined as the highest rate of change in the force time curve (Figure 3). PT and pRTD were normalized (PTn and pRTDn, respectively) to the maximal PT and pRTD collected from the highest MVIC contraction. Fatigue in PT, PTn, pRTD, and pRTDn was calculated as a percent decline using the following equation: %decline=100–100(last Repetition/Initial Repetition). Independent samples t-tests were conducted to investigate the differences in %decline in the PD and OA groups. Separate 2 (Group) × 3 (Contraction) repeated measures ANOVA were run to investigate the differences in PT, PTn, pRTD, and pRTDn between the PD and OA group during the fatiguing knee extension protocol.

Results

Statistical analysis revealed a significant difference in %decline in pRTD (PD: 3.1±55.5 vs. OA: -150.3 ± 143.8, p = 0.017) but not in PT (PD: 31.5 ± 18.3 vs. OA: 33.7 ± 17.0, p = 0.611), PTn (PD: 13.9 ± 28.2 vs. OA: 13.3 ± 45.4, p = .195), pRTDn (PD: 26.6 ± 41.4 vs. OA: -27.7 ± 96.6 p = 0.950) (Figure 4).

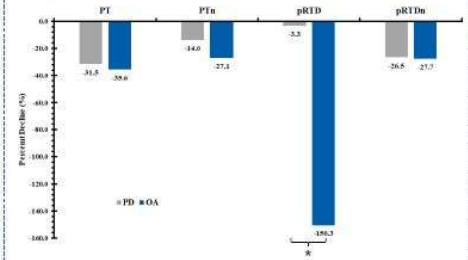


Figure 4. Percent decline in PT, PTn, pRTD, and pRTDn in Parkinson's Disease individuals and older adults. * = Significant difference between PD and OA ($p \leq 0.05$); peak torque (PT), normalized peak torque (PTn), peak rate of torque development (pRTD), normalized peak rate of torque development (pRTDn).

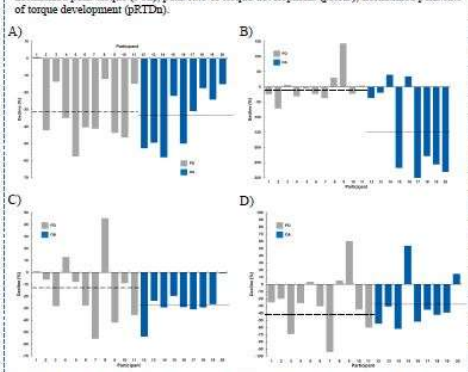


Figure 5. Individual percent decline in PD (gray) and OA (Blue) in **A)** PT, **B)** pRTD, **C)** PTn, and **D)** pRTDn across the thirty repetitions; peak torque (PT), normalized peak torque (PTn), peak rate of torque development (pRTD), normalized peak rate of torque development (pRTDn). Black dashed line represents the average decline in PD and the black dotted line represents the average decline in OA.

There was no group × time interaction for PT (p=0.806), PTn (p=0.774), pRTD (p=0.871), or pRTDn (p=0.945). However, a significant main effect for time was revealed in PT (First rep: 135.1 ± 40.9 Nm vs. Middle rep: 116.8 ± 32.6 Nm vs. Last rep: 102.9 ± 26.8 Nm, p=0.001), PTn (First rep: 1.1 ± 0.5 Nm/MVIC vs. Middle rep: 0.9 ± 0.4 Nm/MVIC vs. Last rep: 0.8 ± 0.4 Nm/MVIC, p ≤ 0.001), pRTD (First rep: 795.9 ± 624.3 Nm/s^{-1} vs. Middle rep: 535.1 ± 413.5 Nm/s^{-1} vs. Last rep: 497.6 ± 396.2 Nm/s^{-1}, p = 0.015), and pRTDn (First rep: 7.1 ± 3.2 Nm/s^{-1} vs. Middle rep: 4.9 ± 5.8 Nm/s^{-1} vs. Last rep: 4.5 ± 5.3 Nm/s^{-1}, p = 0.024) (Figure 6).

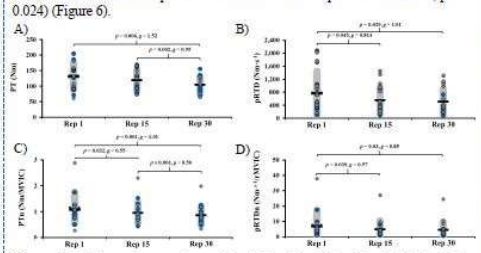


Figure 6. Paired samples t-tests between Rep 1, Rep 15, and Rep 30 in **A)** PT, **B)** pRTD, **C)** PTn, **D)** pRTDn; peak torque (PT), normalized peak torque (PTn), peak rate of torque development (pRTD), normalized peak rate of torque development (pRTDn). Gray dots represent OA. Blue dots represent persons with PD.

Conclusions

These data demonstrate a significant difference in pRTD fatigue between the PD and OA groups. However, the difference is negated when pRTD is normalized to account for PT (pRTDn). The elimination of the differences in pRTDn could be due to the PD having an impaired capacity for rapid torque production compared to OA. These data suggest that the potential fiber type shift in the PD group may contribute to fatigue resistance[5]. The % decline in PT is similar in PD compared to the OA. However, pRTD % decline is greater in the PD compared to the OA suggesting that PD may influence RTD to a greater extent than PT production.

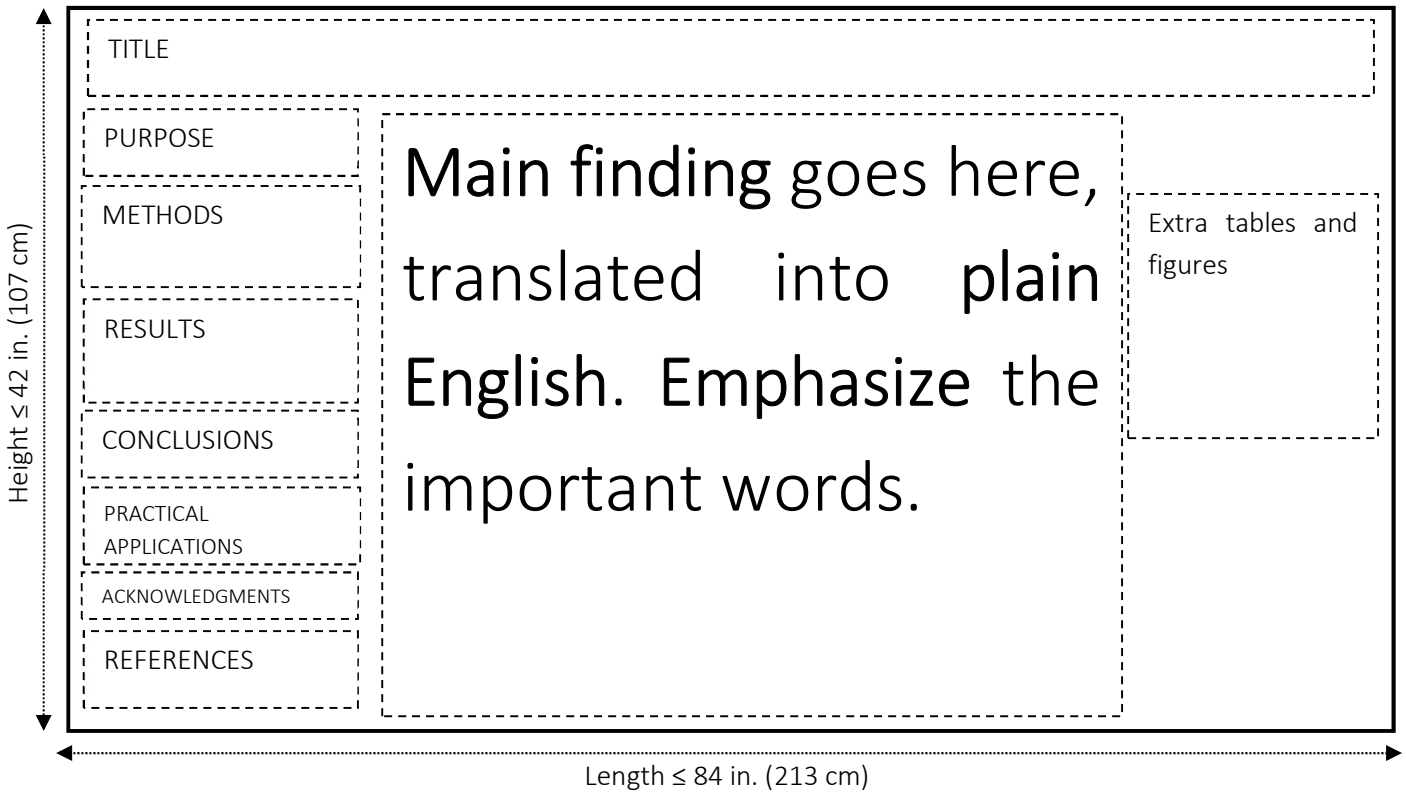
Practical Applications

Coaches, clinicians, and practitioners may use the reduction in the rate of torque production in older adults and persons with Parkinson's Disease following a fatiguing protocol to improve exercise programing.

References

[1]N.A. Kelly, M.P. Ford, D.O. Standaert, R.L. Watts, C.S. Bickel, D.B. Moellering, S.C. Tuggle, J.Y. Williams, L. Lieb, S.T. Windham, M.M. Bamman, Novel, high-intensity exercise prescription improves muscle mass, mitochondrial function, and physical capacity in individuals with Parkinson's disease, Journal of applied physiology 116(5) (2014) 582-92.
[2]M.H. Roe, A. Lokkegaard, S. Sorno-Holm, B.R. Jensen, Effects of training and weight support on muscle activation in Parkinson's disease, Journal of electromyography and kinesiology : official journal of the International Society of Electrophysiological Kinesiology 23(6) (2013) 1499-504.
[3]N.A. Kelly, K.O. Hammond, C.S. Bickel, S.T. Windham, S.C. Tuggle, M.M. Bamman, Effects of aging and Parkinson's disease on motor unit remodeling: influence of resistance exercise training, Journal of applied physiology (2014) (2018) 888-898.
[4]J. Stevens-Lapsley, B.M. Kluger, M. Schenkman, Quadriceps muscle weakness, activation deficits, and fatigue with Parkinson disease, Neurorehabilitation and neural repair 26(5) (2012) 533-41.
[5]G.O. Hammond, R.F. Pfeiffer, M.S. LeDoux, B.K. Schilling, Neuromuscular rate of force development deficit in Parkinson disease, Clinical biomechanics 45(1879-1271 (Electronic)) (2017) 14-18.
[6]Hammond, K.O., Magrini, M.A., Siedlik, J.A., Bickel, C.S., Bamman, M.M. (2021) Influence of muscle fatigue on contractile twitch characteristics in persons with parkinson's disease and older adults: A pilot study. *Clin Parkinsonism Relat Disord*, Aug, 2021.

II. #BETTERPOSTER DESIGN



More information on #betterposter design can be found at https://www.youtube.com/watch?v=1RwJbhkCA58

EXAMPLE OF #BETTERPOSTER DESIGN

2022 Doctoral Student Outstanding Poster Presentation Winner

Trevor Dufner – University of Central Florida

ASSOCIATIONS BETWEEN CHANGES IN INTERLUKIN-8, NEUTROPHIL INTEGRIN EXPRESSION AND EXECUTIVE FUNCTION DURING ACUTE PHYSICAL AND PSYCHOLOGICAL STRESS

Trevor J. Dufner[1], Jessica M. Moon[1], Alyssa N. Varanoske[2,3], Adam J. Wells[1]

[1]Exercise Physiology Intervention and Collaboration Laboratory, University of Central Florida, Orlando, FL
[2]Military Nutrition Division, United States Army Research Institute of Environmental Medicine, Natick, MA, United States
[3]Oak Ridge Institute for Science and Education, Oak Ridge, TN, United States,

Background

Lymphocyte associated antigen-1 (LFA-1/CD11a) and macrophage-1 antigen (Mac-1/CD11b) are cell adhesion molecules that mediate endothelial capture and intravascular crawling of leukocytes during inflammation. Chronically high levels of LFA-1 and Mac-1 expression on neutrophils, along with elevated concentrations of the neutrophil chemokine interleukin-8 (IL-8) have previously been associated with executive dysfunction in elderly individuals (1,2,4-6). However, whether acute perturbations to cellular or systemic mediators of neutrophil recruitment influence cognitive function is unclear. **Purpose:** To examine the relationships between changes in IL-8, LFA-1, Mac-1 and measures of executive function among young healthy individuals during a period of acute physical and psychological stress.

Methods

Participants

- Sixteen males (Age 23.1±3.5years, Body mass 80.9±11.9kg, Height) 174.4±3.8cm.

Sustained Military Operation (SUSOP) Physical and Psychological Stress

- Lecture based training
  - Participants underwent 10 hours of lecture-based training consisting of mission briefs and combat specific activities.
- Military specific physical tasks
  - Participants completed a series of physically demanding activities throughout the entire 24-hour period consisting of pull-ups, vertical jumps, 50-m litter carry, time to exhaustion assessments, and weighted ruck marches (Table 1).
- Sleep and calorie restriction
  - No sleep was permitted throughout the 24-hour time period.
  - A standard snack was provided following the blood draw at 0 Hours (0H) and again at hour 20. A standard meal ready to eat (MRE) was provided at hour 8.

Cognition and Psychological Stress Assessments

- Executive function and psychological stress was assessed at 0H and 24 hours (24H) using Automated Neuropsychological Assessment Metric (ANAM) software.
  - Throughput scores (TP), a measure of cognitive efficiency, were assessed for Mathematical Processing (MP), Matching to Sample (M2S), and Code Substitution Delayed (CSD) tasks.
  - Percent correct responses was assessed for the Go/No-Go (GNG) task.
  - Psychological stress was assessed using the ANAM concussion symptoms inventory (CSI) previously shown to be an efficacious tool to monitor psychological stress/declines (3).

Blood Draws

- Participants blood was drawn at 0H and 24H.

Cell Preparation

- Five mL of Human TruStain FcX FcR was added to 100 µL K2-EDTA-treated whole blood and was allowed to incubate for 10 minutes at room temperature in the dark. The following monoclonal antibodies were then added to the sample and allowed to incubate in the dark at room temperature for 15 minutes: 2.5-mL FITC-conjugated CD15, 5-mL PerCP-conjugated CD45, 5-mL PECy7-conjugated CD11a, 1.25-mL APC-Cy7-conjugated CD16, 5-mL BV605-conjugated CD14 and BV785-conjugated CD11b. Red blood cells were then lysed, and the remaining cells were washed in cell staining buffer. One microliter of eFlour450 fixable viability dye in 300µL phosphate buffered saline was then added to the cells and allowed to incubate for 30 minutes at 4°C. Cells were then washed a final time and resuspended in 300µL of cell staining buffer in preparation for analysis on the Novocyte 3000 cytometer.

Acute perturbations to **IL-8 and neutrophil expression of LFA-1 and Mac-1** are **not** associated with **declines in executive function**

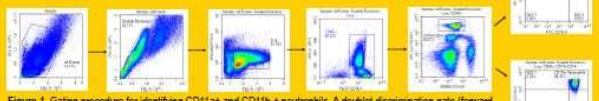


Figure 1. Gating procedure for identifying CD11a+ and CD11b + neutrophils. A doublet discrimination gate (forward scatter height [FSC-H] X forward scatter area [FSC-A] was first used to gate out doublets. Neutrophil populations were then subsequently determined as eFluor 450 FVD- (i.e. live), CD45+, CD16+/CD14-/CD15+ cells. Neutrophils were assessed for LFA-1 and Mac-1 integrin expression. Median fluorescence intensity (MFI) of the markers of interest was recorded, representing the expression per cell. Positivity was determined using quadrant gates relative to fluorescence minus one (FMO) controls.

Time	Event	Details
0800	0H	Hydration, blood draw, snack*, ANAM™, and military specific tasks
0900		
1000		
1100		
1200	Lecture-based training, mission briefs, combat-specific activities	Introduction/basic views on leadership
1300		Introduction to insurgency
1400		Infrastructure of an insurgency
1500		MRE† questions
1600		Counter-guerilla operations
1700		Foreign internal defense
1800		Fundamentals of being a military advisor
1900		Reconnaissance
2000		
2100		Hydration and military Specific tasks
2200		
2300		
2400	Equipment fitting	
0100	Ruck March 1	
0200		Reconnaissance activity and report
0300	Lecture based training	
0400		Hydration, Snack*
0500	Lecture based training	Enter and clear a room (U.S. Army Battle Drill 6)
0600	Ruck March 2	
0700		
0800	24H	Hydration blood draw, and ANAM™

Table 1. Time course and details of the 24-hour SUSOP. ANAM™ = Automated Neuropsychological Assessment Metric. *Standardized diet bar (kcal: 190; protein: 7g; carbohydrates: 19g; fat: 13g; †Selection of different "Meals, Ready-to-Eat" (kcal: 1106±90; protein: 28±6g; carbohydrates: 167±19 g; fat: 33±11g).

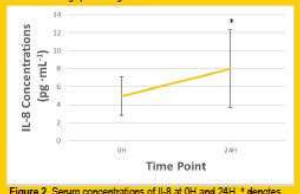


Figure 2. Serum concentrations of Il-8 at 0H and 24H. * denotes significant difference from 0H (p=.007). pg · mL^{-1} = picograms per milliliter.

Figure 3. Neutrophil LFA-1 expression at 0H and 24H. * denotes significant difference from 0H (p=.004). MFI = Median Fluorescence Intensity.

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Methods cont.

Gating Procedure

- Shown in Figure 1, neutrophil integrin expression was analyzed using NOVOExpress software for the 0H and 24H time points.

Blood Assays

- Serum concentrations of IL-8 were assayed using a Luminex Human XL Magnetic Performance Assay (R&D Systems, Cat No. LUXLM000) on a MAGPIX instrument (CV = 1.38%).

Statistical Analysis

- A paired sample t-test was used to compare the changes in each variable at 0H and 24 hours.
- Delta scores for all values were calculated as the change from 0H to 24H.
- Stepwise multiple linear regression analysis was used to examine the relationships of the delta scores for IL-8, LFA-1, and Mac-1 with the delta scores of each executive function variable (GNG, MP, CSD, and M2S).
- An alpha value of $p \leq .05$ was considered statistically significant.

Results

- Frequency ($p<.001$) and severity ($p<.001$) of psychological stress symptoms increased significantly from 0H to 24H.
- IL-8 significantly increased from 0H to 24H ($p=.007$) (Figure 2).
- Neutrophil LFA-1 expression significantly decreased from 0H to 24H ($p<.004$) (Figure 3).
- Significant decreases in M2S ($p = .001$) and CSD TP scores ($p=.009$), as well as GNG percent correct ($p<.001$) were observed from 0H to 24H.
- No significant changes were seen in neutrophil Mac-1 expression ($p=0.84$).
- No significant associations between changes in IL-8, LFA-1, or Mac-1 and in measures of executive function were found.

Conclusion

Acute perturbations in serum IL-8 along with changes in degree of neutrophil integrin expression of LFA-1 and Mac-1 do not appear to be associated with impairments in executive function and increases in psychological stress seen during a SUSOP.

Practical applications: Perturbations to cellular and systemic mediators of neutrophil recruitment do not appear to influence executive function under conditions of acute physical and psychological stress. The influence of other components of the innate immune response on cognitive function during acute physical and psychological stress may warrant further investigation.

Acknowledgments

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or reflecting the views of the Army or the Department of Defense. Any citations of commercial organizations or trade names do not constitute an official Army endorsement of approval of the products or services.

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        ii. How knowledgeable was the student about this project?
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    c. Were the statistical procedures appropriate?
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4. What was the scientific impact of the research?
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- ✓ All data are completed and present at the time of submission.
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