

RESEARCH ABSTRACT SUBMISSION & PRESENTATION GUIDELINES

*Developed by the Scientific Programs Subcommittee
Approved by the NSCA Research Committee*

2011 – 2012

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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.

I. GENERAL INFORMATION

Each year at the NSCA National Conference, the scientific programs consist of three primary sessions: (1) oral research abstract presentations, (2) poster research abstract presentations, and (3) research-based lectures. It is the charge of the NSCA Research Committee to organize the scientific programs; therefore, the Scientific Programs Sub-committee was initiated by the Research Committee to plan the research abstract presentations. Each year, the Scientific Programs Sub-committee oversees the submission of research abstracts, solicits abstract reviewers, and organizes the oral and poster abstract presentation sessions. The purpose of this document, therefore, is to provide specific submission and presentation guidelines to those who wish to present a research abstract at the NSCA National Conference.

Research abstracts that are submitted for presentation at the NSCA National Conference can be delivered as oral or poster presentations. The oral abstract presentations are held between the hours of 9:00 AM and 12:00 noon on Thursday, Friday, and Saturday of the conference in 15 minute intervals. This year, there are only 32 oral presentation slots available. The poster abstract presentations will be held from 11:30 AM – 1:00 PM Thursday, Friday, and Saturday.

There are 9 available categories for research abstracts:

- | | |
|---|--|
| 1. Biochemistry / Endocrinology | 6. Flexibility / Stretching |
| 2. Biomechanics / Neuromuscular | 7. Nutrition / Ergogenic Aids |
| 3. Body Composition | 8. Resistance Training / Periodization |
| 4. Endurance Training / Cardiorespiratory | 9. Speed / Power Development |
| 5. Fitness / Health | |

All research studies that include data recorded from human participants must comply with the ACSM statement regarding the use of human subjects and informed consent (*Medicine and Science in Sports and Exercise*, Vol. 30, No. 7, July 1998, "Policy Statement Regarding the Use of Human Subjects and Informed Consent"). All animal studies must comply with the National Institute of Health (NIH) guidelines regarding the use of animals.

Accepted abstracts (that are presented) will be published as a supplement to the *Journal of Strength and Conditioning Research*; however, this portion of the publication containing the abstracts will only be available online. As always, the Research Committee encourages all research abstract presenters to submit the completed manuscript of their presented research for consideration in the *Journal of Strength and Conditioning Research*.

II. RESEARCH ABSTRACT SUBMISSION GUIDELINES

- Abstracts can only be submitted online at www.ConferenceAbstracts.com/NSCA2012.htm.
- The abstract submission deadline is **5:00 PM MST on Tuesday, March 1, 2012**.
- The NSCA Research Committee specifies that any person who wishes to submit a research abstract for award consideration must be a member of the NSCA. Therefore, the corresponding NSCA membership identification number must be entered at the time of submission.
- Authors are advised not to submit abstracts containing data currently in press in a scientific, medical or professional publication. In the event that data contained in an accepted abstract is published (paper, electronic or other format) prior to the National Conference, the abstract will be withdrawn from the scientific program.
- 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. However, only one abstract may be presented as an oral presentation (with the other presented as a poster), or both abstracts may be presented as posters. If the primary author submitting two abstracts is also applying for the Student Research Award, only one abstract may be designated for consideration for the Student Research Award.
- **Please do NOT submit an abstract if your attendance at the National Conference is questionable!** Abstract presenters must pay the registration fee for the National Conference. By submitting a research abstract as the

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primary author, you must agree that if your abstract is accepted, you will present the abstract or you will forfeit your right to be a primary author any abstract at the next annual NSCA National Conference.

- Those who submit research abstracts will be notified regarding the acceptance/rejection by May 1, 2012. If accepted, this notification will include the date and time of the session/presentation as well as the type of presentation (oral or poster).
- For questions, please e-mail the NSCA at abstracts@nsca-lift.org.

Abstract Formatting Specifications

- All abstract submissions must be formatted correctly (*see example 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*).
- Abstracts must contain the following:
 - ✓ Title (typed in ALL CAPS) cannot exceed 150 characters (*including spaces*).
 - ✓ Author(s) – do not include degrees (i.e., BS, MS, PhD, etc) or credentials (CSCS, etc).
 - ✓ Primary Institution / Laboratory (Institution / Laboratory Name, City, State).
 - ✓ Purpose, Methods, Results, Conclusions, and Practical Applications. Acknowledgements should be included to denote funding sources or conflicts of interest when applicable.
- Abstracts cannot contain the following:
 - ✓ Do not use brand names in the abstract.
 - ✓ Do not use an NSCA research abstract as an advertisement. Research abstracts should be non-biased, free from solicitations, and should not contain demonstrations of products for the purpose of sales. Exhibitor's booths are available from the NSCA National Headquarters for the purpose of advertisement and sales.
- Abstracts can contain either one graph or one table, but not both.
 - ✓ Any graph or table must pertain to the abstract for the purpose of visualizing data and must be referred to in the text of the abstract. Graphs or tables that do not pertain to the abstract will be removed.
 - ✓ The resolution of the graph or table must be adequate for reprinting (i.e., = 150 dpi).
 - ✓ Including a graph or table does not replace any of the required sections (i.e., Purpose, Methods, Results, etc.).
 - ✓ No photos or pictures are allowed – only a graph or a table.
- The following information will also be asked during the online submission process:
 - ✓ Primary / Presenting author's name and NSCA membership number.
 - If the Primary / Presenting author is submitting for award consideration, they must be an NSCA member.
 - ✓ Primary author's professional mailing address, e-mail address, and phone number.
 - ✓ Desired presentation format (i.e., oral, poster, or indifferent).
 - ✓ Abstract category.
 - ✓ If the abstract is eligible for the Student Research Award (*see criteria below*)

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III. EXAMPLE ABSTRACT WITHOUT GRAPH OR TABLE

RELATIVE CONTRIBUTION OF LOWER EXTREMITY JOINT KINETICS TO VERTICAL JUMPING PERFORMANCE

Loren Z.F. Chiu, Phil Wagner, and George J. Salem

University of Southern California, Los Angeles, CA (2007 Student Research Award Winner)

Vertical jump (VJ) performance is recognized as an important measure of explosive strength and is related to sport performance including, weightlifting, sprinting and cycling. A number of investigations have attempted to determine the relative contribution of the ankle plantar-flexors, and knee and hip extensors to VJ performance. These investigations have generally utilized descriptive statistics of joint kinetics, however, no investigations have determined the relationship between joint kinetics and VJ performance. **PURPOSE:** To determine the relative contribution of joint kinetics to VJ performance utilizing regression analysis. **METHODS:** 13 men, competing in power sports (weightlifting, track & field, volleyball) performed restricted (no arm swing) VJ on a force platform. Lower extremity kinematics were recorded from a 6-degree of freedom passive reflective marker set by 8 optoelectric cameras. Standard 3D inverse dynamics were applied to determine the net joint moment (peak), impulse, power (peak concentric & eccentric) and work (concentric, eccentric & total) at the ankle, knee and hip joints. Data for left and right limbs were summed and normalized to body mass. Correlations were determined between the kinetic variables and VJ height. **RESULTS:** Significant correlations existed between VJ height with: 1) concentric net joint power (ankle, knee & hip), 2) concentric net joint work (ankle, knee & hip), and 3) total net joint work (knee & hip). Stepwise linear regression models were generated for each data subset. The regression model utilizing total net joint work resulted in the greatest explained variance ($R^2=0.63$; $p=0.007$). Hip work generated an $R^2=0.39$ ($p=0.023$) & addition of knee work resulted in an R^2 change = 0.24 ($p=0.029$). Standardized Beta-coefficients were 0.341 (hip work) and 0.566 (knee work). Tolerance (0.752) and VIF (1.329) statistics indicate that multicollinearity was low. **CONCLUSIONS:** The regression model generated indicates that total net joint work performed by the hip and knee extensors explains 63% of the variability in VJ performance. As the VJ is a time-dependent task, greater work can be generated if rate of force development increases. The standardized Beta-coefficients suggest that increasing knee extensor work has a greater effect on vertical jump performance than increasing hip extensor work. **PRACTICAL APPLICATIONS:** Exercises that require large rate of force development at the knee extensors, primarily, and hip extensors, secondarily, may therefore be most effective for improving vertical jump performance. The role of the ankle plantar-flexors should not be dismissed, however, as the small sample size resulted in a non-significant correlation ($r=0.42$; $p=0.16$) between total ankle work and VJ height. A larger investigation may elucidate the contribution of the ankle plantar-flexors to the current regression model. **ACKNOWLEDGMENT:** This investigation was supported by an NSCA Student Research Grant.

NOTE: This sample is only for a visual reference of a completed abstract. You will be required to submit your abstract formatted similarly on the *Abstract Submission Form*.

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IV. EXAMPLE ABSTRACT WITH A TABLE

External Loads Eliciting Maximum Concentric Force and Power During Non-Countermovement Knee Extensions

L.W. Weiss, L.Z.F. Chiu, B.K. Schilling, A.C. Fry, K. Buchanan, C. Scates, B.W. Bondurant, and B. Magu. Musculoskeletal Dynamics Lab, The University of Memphis, Memphis, TN.

Strength has been used as an independent term as well as an umbrella one. Mechanical force (F) and power (P) are often considered as “strength” measures. And, since training adaptations typically correspond to specific stimuli, it follows that addressing the most relevant measures during training would yield the best results. So, if high F or P is important for success, and if each expression is load dependent, then identifying the respective loading needed to maximize each during training would be relevant. **PURPOSE:** To determine the relative external load during maximum-acceleration, dynamic constant external resistance (DCER) knee extensions (KE) that results in the highest mechanical F and P, respectively. **METHODS:** Participants were 37 male (body wt 78.3 ± 13.1 kg) fitness-trained lifters. Each subject’s non-countermovement unilateral KE 1RM was determined to standardize loading for ensuing load-spectrum tests. Within 1 week, subjects performed max-acceleration single reps of the same exercise at 40, 65 and 90% 1RM. F and P estimates were obtained using a computer-interfaced dynamometer tethered to the top plate of a KE machine. **RESULTS:** (See Table 1). The highest ($p < 0.05$) peak and average F’s were obtained at 90% 1RM. The highest ($p < 0.05$) peak (pk) and average (aver) P’s occurred at 40% 1RM. **CONCLUSION:** It appears that single-rep, max-acceleration, non-countermovement KE’s are likely to produce the highest external pk and aver F’s at near-maximal loads in young men. For external pk and aver P’s, the highest values appear to occur with relatively low loads. **PRACTICAL APPLICATION:** If training specificity applies, and high F development is desired for DCER KE’s, then high relative loads are needed during training. Concurrently, if high P development is desired, then relatively light KE loads are needed during training.

TABLE 1. External force (F) and power (P) output (mean \pm SEM) for concentric-only unilateral knee extensions.

Variable	40% 1RM	65% 1RM	90% 1RM
*Pk F (N)	391.3 \pm 34.6	496.1 \pm 31.4	599.8 \pm 43.6
*Mean F (N)	330.9 \pm 19.7	420.9 \pm 43.1	505.0 \pm 13.7
**Pk P (W)	748.0 \pm 42.1	697.1 \pm 61.6	630.1 \pm 94.7
**Mean P (W)	353.0 \pm 32.1	328.2 \pm 29.7	297.4 \pm 23.8

* 90% 1RM > 65% 1RM > 40% 1RM ($p < 0.05$).

** 40% 1RM > 90% 1RM ($p < 0.05$) & 65% 1RM = 40 and 90% 1RM ($p < 0.05$).

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V. OVERVIEW OF THE ABSTRACT REVIEWING PROCESS

The Scientific Programs Subcommittee is responsible for reviewing the NSCA Research Abstracts to assure that the correct formatting has been applied and to solicit blinded external review(s) for scientific content. Abstracts that do not meet the previously stated formatting criteria will be sent back to the authors for revisions. When the abstract has been correctly formatted, the Scientific Programs Subcommittee may solicit a blinded external review. The abstract may be externally reviewed for scientific content, appropriate methodology, correct statistical analysis, proper interpretation of results, and contribution to the field of strength and conditioning. In cases when an abstract is rejected by the first reviewer, the Scientific Programs Subcommittee Chair and another external reviewer will independently re-review the abstract in question. If both second reviewers accept the abstract, then it will be accepted. However, if 1 of the 2 subsequent reviewers rejects the abstract, the primary author will be given an opportunity to submit revisions. If no revisions are submitted or if the revisions are not adequate based on a third review by the Scientific Programs Subcommittee Chair and another external reviewer, then the abstract will be rejected.

VI. ORAL ABSTRACT PRESENTATION GUIDELINES

- Currently the Research Committee requires that all oral abstract presentations are prepared in Microsoft PowerPoint.
- All presenters are asked to bring their presentation (.ppt or .pptx) to the conference on a USB flash/jump drive or CD.
 - Exception: Presentations eligible to receive the student research award must be emailed to the NSCA for pre-viewing **before 5pm MST on Wednesday, June 27, 2012**(*see below for details*)
- Presenters are asked to load their presentations onto the laptop (provided by the NSCA) and ensure the presentation displays properly **before 8:30 AM on the day of the presentation**
- All presenters should check in with their session's moderator prior to presenting
 - Moderators are assigned in 1-hour blocks (i.e., 9-10am, 10-11am, and 11-12pm). So, for example, those who are scheduled to present between 10-11am should check-in with their moderator before 10am.
- Oral abstract presentations must be consistent with the contents of the accepted abstract, with an introduction, methods, results, conclusion, and practical application section.
- The oral presentations are 10 – 12 minutes in duration with 3 – 5 minutes of questions from the audience and responses from the primary author / presenter.

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VII. EXAMPLE ORAL PRESENTATION (2008 Student Research Award Winner)

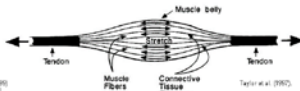
The Effect of Passive Stretching Duration on Musculotendinous Stiffness

Eric D. Ryan, MS, CSCS, NSCA-CPT
 Graduate Assistant
 University of Oklahoma
 Department of Health and Exercise Science
 Biophysics Laboratory



Introduction

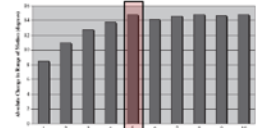
- Clinically, reduced ankle ROM is related to a number of leg disorders
 - Hypertonia following cerebrovascular disease¹
 - Achilles tendinitis²
 - Plantar fasciitis³
- Passive stretching exercises are a common modality performed to increase flexibility or pain-free range of motion (ROM).



Introduction

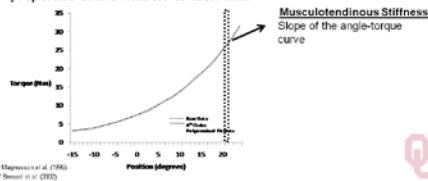
Passive Stretching

- In many instances the time many allied health professionals see patients is limited. Thus, the minimal duration of stretches to increase ROM is warranted.
- Boyce and colleagues (2008) recently reported the minimal number of stretches to increase ROM includes 5 (15-s) repetitions.



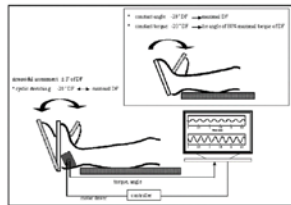
Introduction

- However, joint range of motion only provides limited information about the behavior of the muscle-tendon unit¹.
- In fact, previous authors² have suggested that stretching-based interventions should focus on altering the passive mechanical properties of the muscle-tendon unit.



Introduction

Yeh, C., J.J. Chen, and K. Tsai. Quantifying the effectiveness of the sustained muscle stretching treatments in stroke patients with ankle hypertonia. *J Electromyogr. Kinesiol.* 2007.

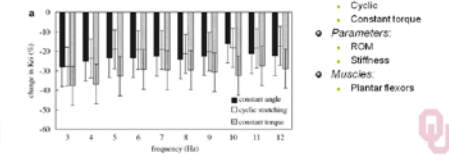


- Subjects:
 - n = 47 stroke patients
- Stretching Protocol:
 - 30 min of stretching
 - Constant angle
 - Cyclic
 - Constant torque
- Parameters:
 - ROM
 - Stiffness
- Muscles:
 - Plantar flexors

Introduction

Yeh, C., J.J. Chen, and K. Tsai. Quantifying the effectiveness of the sustained muscle stretching treatments in stroke patients with ankle hypertonia. *J Electromyogr. Kinesiol.* 2007.

Constant torque stretching treatments were the most effective at reducing the stiffness of the plantar flexor muscles.

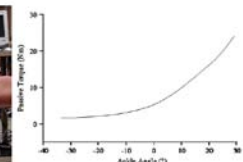
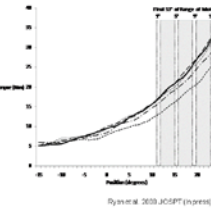


Purpose

- The purpose of the present study was to extend the findings of Boyce et al. (2008) and Yeh et al. (2007) and to determine the minimal number of constant-torque passive stretches to elicit decreases in plantar flexor musculotendinous stiffness.

Methods

- Subjects:
 - 13 healthy participants (23 ± 3 yrs)
- Equipment:
 - Biodesx System 3 Dynamometer
- Intervention:
 - Four 30-s (20-s of rest) constant torque passive stretches of the plantar flexor muscles.
- Measurements:
 - MTS was measured at:
 - Pre-stretching
 - During (at the beginning of each stretch)
 - Post-stretching
 - The angle-torque curves were fit with a 4th-order polynomial regression model.
 - MTS was calculated at every 4th degree in the final 13 degrees from the pre-MTS assessment common to all stretches

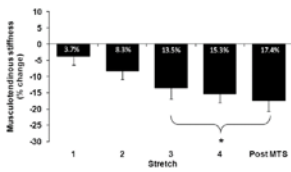


Methods

- Statistics:
- MTS: Two-way repeated measures ANOVA (time x angle) (time [pre vs stretch 1 vs stretch 2 vs stretch 3 vs stretch 4 vs post] x angle [1° vs 5° vs 9° vs 12°])
 - SPSS v 14.0 was used for all statistical analyses
 - Statistical significance was set at $P \leq 0.05$

Results

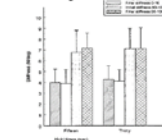
- MTS quantified for the 3rd and 4th stretches and post MTS assessment were less than the pre-MTS assessment, however they were not different from each other.
- Two 30-s (1-min time under stretch) constant torque stretches reduced MTS.



Results

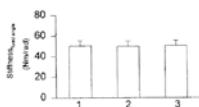
McNair et al. 2001 *MSSE*

- Stretches
- Four 15-s
 - Two 30-s
- Muscles: Plantar flexors
- Results: No change in MTS following 1 min of constant angle stretching



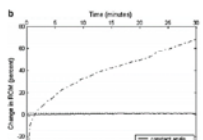
Magnusson et al. 1998 *Int J Sports Med.*

- Stretch
- One 90-s
- Muscles: Hamstrings
- Results: No change in MTS following 1 min of constant angle stretching



Conclusions

- Two 30-s constant-torque stretches reduced MTS. However, 2 subsequent 30-s stretches did not further decrease MTS. These findings contrasted previous studies (McNair et al. 2001 & Magnusson et al. 1998) using common constant-angle (static) stretching exercises.
- It is possible that constant-torque stretching may elicit greater muscle creep (i.e. strain relaxation), which may translate to greater reductions in MTS (Ryan et al. 2008)

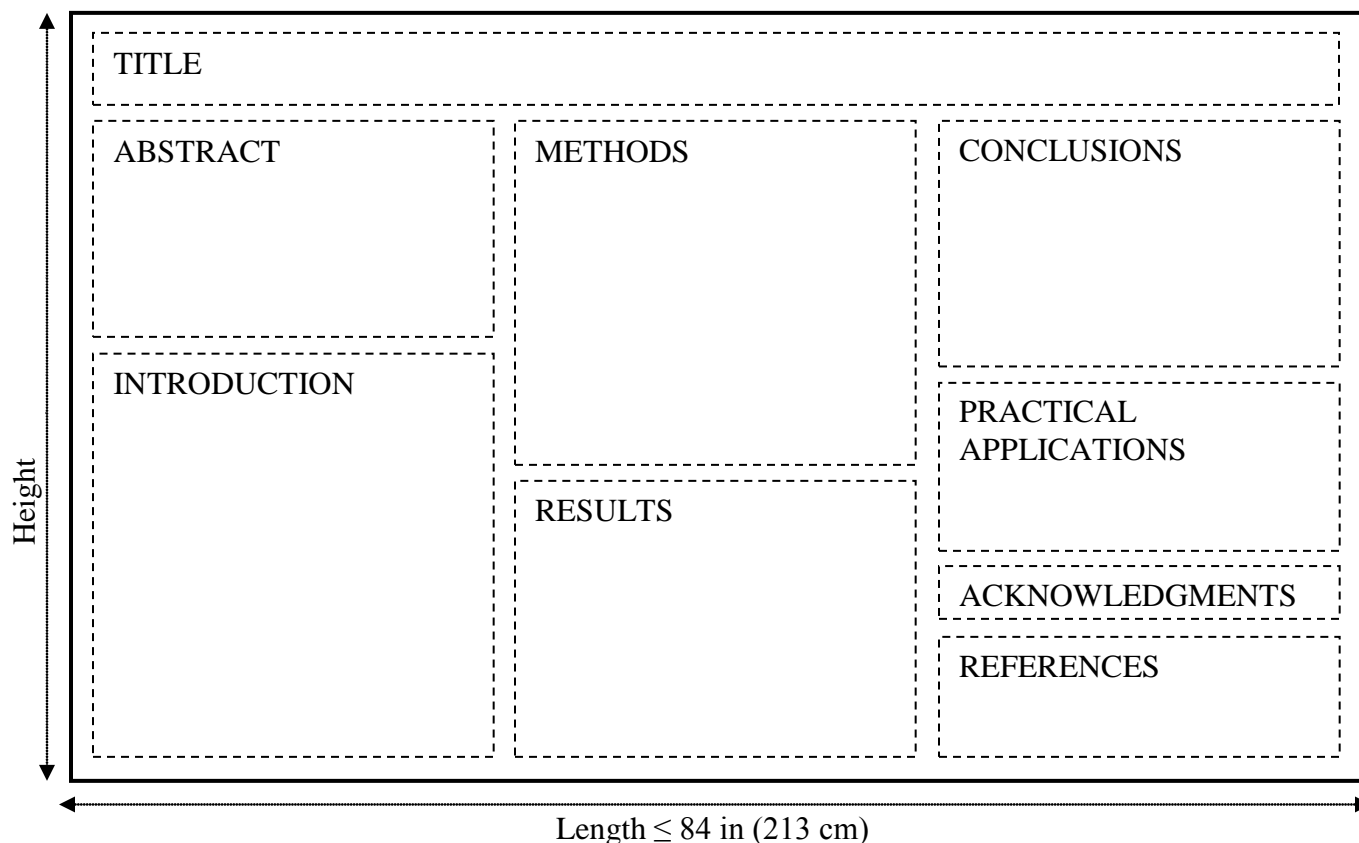


Practical Applications

- These findings may be important for allied health professionals who are looking for the minimal duration of passive stretching necessary to reduce MTS.
- When stretching patients, it may be important to maintain a constant force throughout the duration of the stretch to enhance the reduction in MTS seen during stretching exercises.

VII. POSTER ABSTRACT PRESENTATION GUIDELINES

- The Research Committee requires that all poster presentations be printed on 1 uniform poster sheet with dimensions not exceeding 42 × 84 in (107 × 213 cm). Unless otherwise noted, the poster boards on which the posters are hung are 48 × 96 in (122 × 244 cm).
 - Note: Presentations eligible to receive the student research award must be emailed to the Scientific Programs Subcommittee Chair for pre-viewing **before 5pm MST on Wednesday, June 27, 2012**(see below for details)
- Presenters are required to supply their own thumb tacks by which to hang their posters.
- Poster abstract presentations must be consistent with the contents of the accepted abstract, with an introduction, methods, results, conclusion, and practical application section.
- The Research Committee recommends the following layout as a general guideline for all poster presentations:



VIII. EXAMPLE POSTER PRESENTATION (2008 Student Research Award Winner) – see next page.

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Effects of Three-Weeks High-Intensity Interval Training and β -Alanine Supplementation on Endurance Performance and Aerobic Metabolism in College-Aged Men

Abbie E. Smith, Jennifer L. Graef, Ashley A. Walter, Kristina L. Kendall, Jordan R. Moon, Christopher M. Lookwood, Travis W. Beck, Joel T. Cramer, FNCSA, and Jeffrey R. Stout, FNCSA University of Oklahoma, Norman, OK; Department of Health and Exercise Science, Email: abbiesmith@ou.edu

Abstract

Intermittent bouts of high-intensity exercise result in diminished stores of energy substrates, followed by an accumulation of metabolites. This type of high-intensity interval training (HIIT) promotes chronic physiological adaptations in substrate utilization and muscle buffering capacity. In addition, β -alanine has been accepted as an effective physiological buffer. Concurrent HIIT and β -alanine supplementation may result in a greater reliance on aerobic metabolism and an improvement in actin-myosin kinetics due to a reduced hydrogen ion (H^+) accumulation. **PURPOSE:** The purpose of this study was to examine the effects of 9 sessions of HIIT and 21 days of β -alanine supplementation on endurance performance (VO_{2peak} , TTE, TWD) and aerobic metabolism in recreationally active college-aged men. **METHODS:** Forty-one recreationally active college-aged men (Age: 22.23 \pm 4.5 years; VO_{2peak} : 42.46 \pm 3.33 $l \cdot min^{-1}$; 3.33 $l \cdot min^{-1}$) volunteered to participate in this double-blind, placebo-controlled study. In a random fashion, all participants were placed into one of three groups: placebo (PL; n = 10; 5g of flavored dextrose powder per packet; n=6); β -alanine (BA; n = 15; 6g β -alanine plus 15g of flavored dextrose powder per packet; n=6); or control (CON; n=9) groups. Each supplement group ingested one packet 4 times per day (total of 6g/day) for 21 days. Prior to- and following training, participants performed a cycle ergometer test to exhaustion (TTE), VO_{2peak} , and TWD. VO_{2peak} and TWD were determined from the highest 15-min period, which was further used to establish total time to exhaustion (TTE, seconds). Participants were further assessed for total work done (TWD), calculated from the total time (T, seconds) completed at a workload corresponding to 110% of their maximal power output (watt). We determined the maximal oxygen consumption test [TWD (kJ) = (T x W)/1000]. Following initial testing, all participants in the β -alanine and placebo groups engaged in 3 weeks of HIIT training on a cycle ergometer. Each training session consisted of 5 bouts of 4:21 minute cycling work to rest ratio, introduced in an undulating progression starting at 90% VO_{2peak} power output and reaching 110%. Separate two-way ANOVAs (group [BA vs. PL vs. CON] x time [Pre- vs. Post]) were used to identify any group by time interactions. **RESULTS:** Significant group by time interactions were demonstrated for all variables: VO_{2peak} ($p < 0.05$), TTE ($p < 0.04$) and TWD ($p < 0.03$). Follow-up dependent samples t-tests showed a significant increase for both training groups in VO_{2peak} (BA: 7.3%; PL: 9.1%), TTE (BA: 11.7%; PL: 10.6%), and TWD (BA: 53.9%; PL: 39.7%) from pre- to post-training and supplementation, with no differences between groups. The use of β -alanine, although not significantly different from PL, demonstrated a trend toward greater improvements in aerobic metabolism and endurance performance. **PRACTICAL APPLICATIONS:** The chronic use of β -alanine may improve aerobic metabolism and endurance performance. **CONCLUSIONS:** The addition of β -alanine to physiological adaptations resulting from HIIT training are practical and immense. The addition of β -alanine has no influence on oxygen kinetics, but resulted in a trend for delaying fatigue.

Introduction

The use of high-intensity exercise as a training modality has been shown to stimulate acute and chronic physiological adaptations (cardiovascular, metabolic, respiratory, and neural), which ultimately lead to improved performance (3). While HIIT has been shown to enhance performance after as little as two weeks, the actual training recruits a large level of muscle fibers resulting in several contraction-induced metabolic disturbances, causing a significant reduction in muscle energy substrates (adenosine triphosphate (ATP), PCr, and glycogen) along with increasing intramuscular metabolites (adenosine diphosphate (ADP), inorganic phosphate (P_i), and H⁺) (1,5). Scientists have suggested the use of β -alanine to enhance training adaptations, in conjunction with HIIT. In particular, Harris et al. (2) and Hill et al. (4) have posited that increasing skeletal muscle carnitine concentration with β -alanine supplementation may improve the ability to stabilize the intramuscular pH during intense exercise by buffering accumulating H⁺. In theory, increasing intramuscular carnitine levels with β -alanine supplementation may enhance the quality of HIIT and lead to greater physiological adaptations.

Purpose

The purpose of this study was to examine the effects of 9 sessions of HIIT and 21 days of β -alanine supplementation on endurance performance (VO_{2peak} , TTE, TWD) and aerobic metabolism in recreationally active college-aged men.

Methods

Forty-one recreationally-trained (1-5 hours/week), college-aged men volunteered to participate in this investigation. **Oxygen consumption measurements** Open-circuit spirometry was used to calculate the VO_{2peak} and ventilatory threshold (VT) with a metabolic cart (True One 2400B Metabolic Measurement System, Parvo-Medics Inc., Provo UT). The data was averaged over 15-s intervals. The highest 15-s VO_{2peak} value was recorded as the maximal oxygen uptake (VO_{2peak}) if it coincided with at least two of the following criteria: (a) a plateau in heart rate (HR) or HR values within 10% of the age-predicted HRmax, (b) a plateau in VO_{2peak} (defined by an increase of no more than 150 ml min^{-1}), and/or (c) an RER value greater than 1.15.

Determination of VO_{2peak} & VT

All participants performed a continuous graded exercise test (GXT) on an electronically-braked cycle ergometer (Conval 400, Groningen, The Netherlands) to determine VO_{2peak} and ventilatory threshold (VT). During each GXT, the initial power output was set at 50 W and increased by 25 W every two minutes until the participant could no longer maintain the required power output at a pedaling rate of 70 rpm, or voluntary termination due to fatigue. Ventilatory threshold was determined from a plot of ventilation (V_E) against VO_{2peak} . Two linear regression lines were fit to the lower and upper portions of the V_E vs. VO_{2peak} curve, before and after the break points, respectively. The intersection of these two lines was defined as VT.

Time to Exhaustion cycling test

Each participant performed a TTE test on an electronically-braked cycle ergometer. A cadence of ~70 rpm. Participants performed a five-minute warm-up at 50 W, followed by a cycle to exhaustion at their individual pre-determined workload, established at 110% of the maximum VO_{2peak} workload (W). The subjects' TTE was defined by the time (in seconds) that could be maintained without dropping below a cadence of 60 rpm. Total work done was further calculated as the primary variable of interest, using the product of time (in seconds) and the power output (W), divided by 1,000, and presented in kilojoules (kJ).

β -Alanine supplementation

Throughout the three-week training period, the participants supplemented with 6 g per day (β -alanine (1.5 g β -alanine, 15 g dextrose) or placebo (16.5 g dextrose). On the three days that subjects were in the lab for training, they consumed two pre-mixed doses, one 30 minutes before, and one immediately after completion of the training session. The remaining two remaining four days of the week, participants were instructed to mix and consume the four doses (6 g per day) of their respective supplement.

Training intervention

Training was performed on an electronically-braked cycle ergometer (Conval 400, Groningen, The Netherlands) to maintain testing consistency. The training intensity began at 90% of the maximum power output achieved during the baseline VO_{2peak} test and progressed in an undulating manner, reaching a maximum of 110% by the end of the three-week training period (Figure 1). The training period consisted of two-minute intervals with one-minute rest periods.



Results

There were significant improvements in endurance performance after three weeks of HIIT. The VO_{2peak} , VO_{2peak} and TWD increased significantly in both training groups (β -alanine and placebo). Significant group by time interactions were demonstrated for all variables: VO_{2peak} ($p < 0.05$), TTE ($p < 0.04$) and TWD ($p < 0.03$). Follow-up dependent samples t-tests showed a significant increase for both training groups in VO_{2peak} (BA: 7.3%, PL: 9.1%), TTE (BA: 11.7%, PL: 10.6%) and TWD (BA: 53.9%, PL: 39.7%) from pre- to post-training and supplementation, with no differences between groups. Individualized data (Figures 1-3) also support similar improvements among both treatment groups with 94%, 100% and 100% of the individuals improving in both groups for VO_{2peak} , TTE and TWD, respectively.

BA	VO_{2peak} ($ml \cdot min^{-1}$)		TTE (sec)		TWD (kJ)		
	Pre	Post	Pre	Post	Pre	Post	
mean	3.28	3.52*	116.2	130.4**	58.4	89.0**	
SE	0.13	0.12	18.27	19.97*	5.5	8.0**	
PL	mean	3.28	3.52*	116.2	130.4**	58.4	89.0**
SE	0.13	0.13	18.3	18.2	3.1	6.1	
CON	mean	3.49	3.68*	119.3	128.7*	57.6	69.7
SE	0.2	0.19	64.9	68.2	5.7	8.5	

* indicates a significant change from pre- to post; ** indicates a significantly greater change compared to CON.

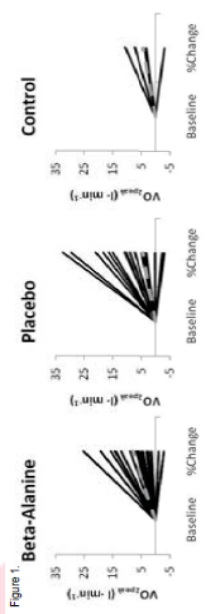


Figure 1.

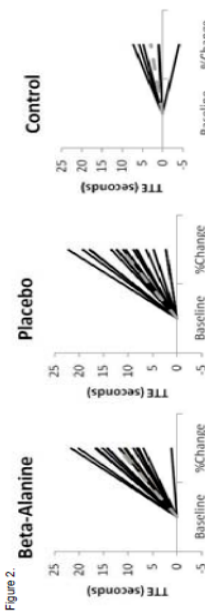


Figure 2.

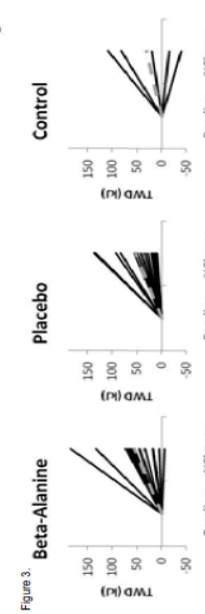


Figure 3.

Figures 1-3. Individual responses for each subject within the β -alanine, placebo, and control groups for maximal oxygen consumption (VO_{2peak} ($ml \cdot min^{-1}$), time to exhaustion (TTE, s), and total work done (TWD, kJ). Values are reported as percent change from pre to post. The mean is denoted by the dashed line.

Conclusions

The current HIIT protocol, utilizing a 2:1 work to rest ratio, resulted in comparable, if not greater, cardiovascular adaptations than previously reported from HIIT training. It appears that acute (β -alanine supplementation does not significantly enhance cardiovascular adaptations) and chronic (β -alanine supplementation does not significantly enhance cardiovascular adaptations) use of β -alanine may improve VO_{2peak} more than moderate training. *Med Sci Sports Exerc* 2007;39(4):665-671.

Practical Applications

The use of a short-term HIIT regimen is an effective and time efficient method to enhance aerobic metabolism and endurance performance. The addition of β -alanine to this regimen may improve VO_{2peak} and TWD. Examining the chronic ingestion of β -alanine, following the recommended 28-day loading phase, may result in greater adaptations.

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IX. STUDENT RESEARCH AWARD DESCRIPTION AND JUDGING CRITERIA

The NSCA rewards outstanding research efforts by students through the NSCA Student Research Awards. Four awards are given each year:

1. Doctoral Student Research Award for an outstanding *oral* abstract presentation
2. Doctoral Student Research Award for an outstanding *poster* abstract presentation
3. Master's Student Research Award for an outstanding *oral* abstract presentation
4. Master's Student Research Award for an outstanding *poster* abstract presentation

NSCA Student Research Award Criteria:

- Each applicant must be a current NSCA member.
- The candidate must be enrolled as a full-time student at the time of abstract submission *or* have completed his/her degree no more than 1 year prior to the NSCA National Conference.
- The abstract and the online NSCA abstract form must be completed according to the required specifications (*see above*) and the "Student Award" option box must be checked.
- The presentation guidelines (either oral or poster) must be met as stated in this document.
- A student can be the primary author on a maximum of 2 abstracts; however, only 1 abstract can be eligible for the Student Award.
- If the abstract is accepted, the applicant will be designated as a candidate for the Student Research Award for either the oral or poster presentation sessions, depending on the indicated presentation format preference.
- Student Award candidates must attend the NSCA National Conference to present their research, and the winner will be announced at the NSCA Awards Banquet on the Friday evening of the conference.

Important note for Student Award Candidates!

Due to a large number of oral and poster presentations each year, all Student Award candidates are required to e-mail their slide presentations (PowerPoint, .ppt, .pptx; or .pdf formats) and posters (.ppt, .pptx, .jpeg, .gif, .tiff, or .pdf formats) to the NSCA at abstracts@nsca-lift.org by **5pm MST on Wednesday, June 27, 2012**. This will allow the judges to view the slides and posters in advance to expedite the judging process. Also, all posters that are being considered for the Student Award must be hung on the appropriate poster board by 10:00 AM on the day of the presentation.

NOTE: Many students are eliminated from the competition because their oral or poster presentations do not contain the required elements (i.e., purpose, methods, results, conclusions, and practical applications). Specific guidelines are provided for the oral and poster presentations earlier in this document. Therefore, students are encouraged to closely follow these guidelines to remain competitive for the Student Research Award.

Student Award Judging Criteria

Below are 5 basic questions and several sub-questions that are used by the judges to evaluate the Student Award candidates. Each question is answered with a Likert scale response on evaluation sheets, with spaces for judges comments. The points are tallied and comments considered to narrow the candidates for consideration. After all of the presentations are delivered, the judges meet to make their selection prior to the NSCA Awards Banquet.

1. Was the presentation knowledgeable and professional?
 - a. For oral presentations – Were the slides readable?
 - b. For poster presentations – Was the poster readable?
 - c. How involved was the student with this project?
 - i. Did the student provide well-informed responses to the questions?
 - ii. How knowledgeable was the student about this project?
 - d. How well did the authors follow the guidelines for abstract presentations (component parts)?
2. Was the introduction / literature review sufficient and relevant?
3. Was the study well designed?
 - a. Was the purpose clearly stated?
 - b. Did the methodology address the research question?
 - c. Were the statistical procedures appropriate?
 - d. Were the conclusions valid based on the results of the study?
4. What was the scientific impact of the research?
5. How well did the student *bridge the gap* with the Practical Applications?

See Appendix the following 2 pages for examples of the Student Research Award Judging Sheets.

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.

Student Research Award Judging Sheet (*Oral Presentation*)

Directions: Please circle the most appropriate Likert scale value for each question. Provide comments when applicable. The Likert scale points will be tallied, and the comments will be considered to narrow the candidates for consideration.

Oral Presentation Primary Author:

	Poor	Fair	Avg.	Good	Excell.
1. Was the presentation professional?	1	2	3	4	5
a. Were the slides readable?	1	2	3	4	5
b. How involved was the student with this project?	1	2	3	4	5
c. Did the student provide well-informed responses to the questions?	1	2	3	4	5
d. How knowledgeable was the student about this project?	1	2	3	4	5
e. How well did the authors follow the guidelines for abstract presentations (component parts)?	1	2	3	4	5
2. Was the introduction / literature review sufficient and relevant?	1	2	3	4	5
3. Was the study well designed?	1	2	3	4	5
a. Was the purpose clearly stated?	1	2	3	4	5
b. Did the methodology address the research question?	1	2	3	4	5
c. Were the statistical procedures appropriate?	1	2	3	4	5
d. Were the conclusions valid based on the results of the study?	1	2	3	4	5
4. What was the scientific impact of the research?	1	2	3	4	5
5. How well did the student <i>bridge the gap</i> with Practical Applications?	1	2	3	4	5

Total Points: _____/70

General Comments:

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Student Research Award Judging Sheet (*Poster Presentation*)

Directions: Please circle the most appropriate Likert scale value for each question. Provide comments when applicable. The Likert scale points will be tallied, and the comments will be considered to narrow the candidates for consideration.

Poster Presentation Primary Author:

	Poor	Fair	Avg.	Good	Excell.
1. Was the presentation professional?	1	2	3	4	5
a. Was the poster readable?	1	2	3	4	5
b. How involved was the student with this project?	1	2	3	4	5
c. Did the student provide well-informed responses to the questions?	1	2	3	4	5
d. How knowledgeable was the student about this project?	1	2	3	4	5
e. How well did the authors follow the guidelines for abstract presentations (component parts)?	1	2	3	4	5
2. Was the introduction / literature review sufficient and relevant?	1	2	3	4	5
3. Was the study well designed?	1	2	3	4	5
a. Was the purpose clearly stated?	1	2	3	4	5
b. Did the methodology address the research question?	1	2	3	4	5
c. Were the statistical procedures appropriate?	1	2	3	4	5
d. Were the conclusions valid based on the results of the study?	1	2	3	4	5
4. What was the scientific impact of the research?	1	2	3	4	5
5. How well did the student <i>bridge the gap</i> with Practical Applications?	1	2	3	4	5

Total Points: _____/70

General Comments:

MISSION STATEMENT

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