THE EFFECTS OF VARIOUS WARM-UP IMPLEMENTS AND REST PERIODS ON BATTING ACCELERATION AND VELOCITY A. L. MILLER, 1 J. M. WILSON, 1 M. CANNATA, 1 K. THOMPSON, 2 T. J. MORRISON, 1 C. BERGMAN, 1 N. DUNCAN, 1 J. ANDERSEN, 1 K. MORRIS, 1 C. BAIETTO, 1 R. LOWRY, 1 K. OTERO, 1 J. O'SULLIVAN, 1 AND D. J. SZYMANSKI3
1Health Sciences and Human Performance, University of Tampa, Tampa, FL; 2Athnetix Inc., Arcado, NY; and 3Department of Kinesiology, Louisiana Tech University, Ruston, LA Purpose: We examined the effects of five variably weighted warm-up bats on batting acceleration and velocity over time. It is common among competitive baseball players to swing bats while in the batter's box in an attempt to improve their batting performance. Players use bats of different weights during this time and only a few studies have evaluated the optimal bat weight to increase performance. Previous studies have not investigated the optimal rest period associated with bats of varying weight. Methods: To answer these questions, ten trained NCAA Division II baseball players, (age = 20.0 6 2 yr, body mass = 88.3 6 15.8 kg, playing experience = 13.5 6 3.5 yr) volunteered to be tested on 26 oz, 30 oz, 34 oz, 38 oz and 50 oz bats to see if there was an optimal peak in batting velocity at time periods of 30 seconds, 2 minutes, 4 minutes and 8 minutes, post-warmup. Measured variables were peak velocity in the hitting zone (PVHZ), peak velocity of the swing (PV), peak acceleration (PA), and time to reach peak acceleration (TPA) using a chronograph, which measured batting velocity in real time every 10 ms throughout the swing. A repeated measures ANOVA was run to assess differences over time and post hoc tests were used to look at differences among bat weights. Results: There were significant time effects ($p = 0.05$) for PVHZ, PV and PA, but not for TPA. PVHZ peaked at 4 minutes, with a 5.9% increase compared to baseline swings. Peak velocity (PV) and acceleration (PA) increased over all time periods, with the greatest

increase occurring at 8 minutes. Respectively, these variables increased above the baseline by 7.8% and 9.8% at 8 minutes. There were no significant effects on the variables among bat weights used in warm up (p . 0.05). Conclusions: The data suggest batters can maximize their performance by warming up in the batter's box. Bat weight used to warm-up does not affect swing performance as much as the rest period between warming up and actually swinging at the plate. Practical Applications: Ideally, batters should warm-up early in the batter's box and rest for 4-8 minutes before they swing at the plate for maximum performance. Alternatively, the data implies that pitchers should throw their fastest pitch near the beginning of the at bat to correspond with the potentially slower bat speeds.

EFFECT OF VARIOUS RESISTED TRAINING DEVICES ON BAT SWING AND BATTED-BALL VELOCITIES OF NOVICE COLLEGE STUDENTS D. J. SZYMANSKI, S. L. CLARK, D. M. ACCARDO, E. J. BEISER, K. E. BASSETT, J. M. SZYMANSKI, G. L. MEDLIN, AND M. E. TILL Applied Physiology Laboratory, Louisiana Tech University, Ruston, LA Introduction: There are various ways to increase strength and power. In baseball/softball it is important to not only increase strength, but to increase sport-specific rotational power that attempts to mimic the actual baseball/softball swing pattern. Purpose: To examine the effects of 8 weeks of sport-specific resistance training on bat swing and batted-ball velocities of novice college students. Methods: Seventy-one students, ages 17-22 yr, volunteered for this study. Participants were randomly assigned to 1 of 3 experimental groups based on bat swing velocity (BV) using a stratified sampling technique. Group 1 (M = 14, W = 11) was the control group TABLE 1. Change in 1RM Bench Press strength due to the 6-week training intervention. *Significantly different from baseline 1RM. Baseline 1RM (kg) Post 1RM (kg) Effect Size p NORMAL 121.7 128.3 0.41

0.438 LOW RACK 118.3 145.8* 1.59 0.001 HIGH RACK 124.2 129.2 0.40 0.482 Note: No significant differences between groups at baseline or post-intervention. VOLUME 26 | SUPPLEMENT 1 | FEBRUARY 2012 | S13 Journal of Strength and Conditioning Research the TM | www.nsca-jscr.org Copyright © National Strength and Conditioning Association Unauthorized reproduction of this article is prohibited. that swung a standard game bat. Men swung a 33 in, 30 oz baseball bat while women swung a 33 in, 23 oz softball bat. Group 2 (M = 14, W = 11) performed bat swings with a standard game bat while wearing weighted batting gloves made by Draz Athletics. Group 3 (M = 12, W = 9) performed bat swings with a standard game bat while wearing the Pitcher's Nightmare (resistance band device worn on the back arm and leg). All participants had 2 familarization training sessions to practice bat swing mechanics and hitting a tennis ball off of a batting tee into a net. Pre- and posttesting included height, weight, percent (%) body fat measured by a Tanita device, lean body mass (LBM), grip strength with a Jamar hand dynamometer, vertical jump with a Vertec, 6-lb medicine ball side toss measured by a Stalker Pro radar gun, BV recorded with a SETPRO SPRT5A chronograph, and batted-ball velocity (BBV) measured with a Stalker Pro radar gun. Training for all 3 groups consisted of hitting tennis balls off of a batting tee 3 d/wk in for 8 weeks. The number of total swings/day and week are displayed in the table below. Groups 2 and 3 used a 2:1 ratio of resistance device to no resistance. Results: Paired sample t-tests indicated that Groups 1 and 3 made significant (p # 0.05) improvements in BV. Only group 3 made significant improvements in BBV. A one-way ANOVA was done on the differences between preand posttest scores (delta scores) across the 3 groups on BV and BBV. Significant differences between groups were determined through a Scheffe post hoc F test for BV. Groups 1 and 3 were significantly different than group 2, but not from each other.

Conclusions: Novice individuals can increase BV by swinging either a standard bat or a standard bat while wearing a resistance band on their back arm and leg. Practical Applications: For novice players, it is recommended to wear the Pitcher's Nightmare while hitting because it not only increased BV, but may have had a positive effect on swing mechanics, which in turn, helped participants hit the ball more consistently off the sweet spot of the bat, resulting in increased BBV.

EFFICACY OF POTENTIATION OF PERFORMANCE THROUGH OVERWEIGHT IMPLEMENT THROWS ON COLLEGIATE AND ELITE WEIGHT THROWERS L. W. JUDGE, 1 D. BELLAR, 2 M. TURK, 3 M. JUDGE, 4 AND E. GILREATH1 1Physical Education, Sport, and Exercise Science, Ball State University, Muncie, IN; 2Department of Kinesiology, University of Louisiana at Lafayette, Lafayette, LA; 3Department of Intercollegiate Athletics, University of Illinois, Urbana, IL; and 4Throw1Deep Sports, Marietta, GA Post Activation Potentiation (PAP) is a well-known property of muscle but the impact of PAP on human performance is less understood. Track and field throws coaches sometimes utilize heavy implements prior to competition to potentiate performance in the weight throw event. Purpose: The purpose of the investigation was to determine the acute effects of two different overweight implements on weight throw performance. Methods: The participants were seventeen elite and collegiate weight throwers (age: 22.8. 6 3.1 yrs, ht: 185.0 6 .06 cm, wt: 108.8 6 19.14 kg, Sq 1RM: 194.34kg 6 32.4, Power Cl 1RM: 121.3kg 6 2.86, weight throw PR: 18.53 6 2.9m). A within subjects design was used to compare the acute effects of throwing an overweight implement prior to the lighter competition weight. Participants reported to the throwing field on four separate occasions. On the first visit, participants became familiar with the technique of the one-turn weight throw. On the second through

forth visits participants warmed up (; 15 min of dynamic stretching) and then completed three maximal effort one-turn throws with an outdoor competition weight (9.1kg for women, 15.9kg for men). Each attempt was preceded by one of three randomly assigned treatments. The treatments included a one-turn throw with either an implement 1.37kg heavier than the competition implement (OVRWGHT1) or 2.27kg heavier than the competition implement (OVRWGHT2), or a regulation weight implement (STAND). The distance for each of the maximal effort one-turn weight throws was measured. Results: Analysis via repeated measures ANOVA revealed a main effect for Treatment ($p = 0.006$) as well as a significant interaction effect for Treatment by Time ($p = 0.041$). The means for the OVRWGHT1 treatment (16.08m 6 2.5) and OVRWGHT2 (16.08m 6 2.7) were not different, however the mean for STAND was significantly lower than the other treatments (15.58 6 2.5, p , 0.02). Changes in performance between OVRWGHT treatments and STAND were found to correlate to 1RM Power Clean (Improvement for OVRWGHT1, $r = 0.536$, $p = 0.016$; Improvement for OVRWGHT2, $r = 0.548$, $p = 0.014$). Conclusion: The results suggest collegiate and elite athletes who utilize overweight implements in the warm-up may improve performance, and stronger athletes may be better suited to realize the full benefit of this effect. Practical Applications: Based on demonstrated effectiveness, coaches can create greater variety in employing PAP in their training plans by utilizing both of the overweight implements to increase performance. However, coaches should be advised that the strength level of the athlete is related to the effectiveness of the use of overweight implements, and that weaker athletes will likely not benefit from this form of treatment. Further research is needed to determine the impact of an athlete’s strength and training status on pre-activity protocols utilizing post-activation potentiation.