PRELIMINARY INVESTIGATION: UPPER EXTREMITY POWER OUTPUT VIA SEATED MEDICINE BALL ASSESSMENT IN FEMALES.

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INTRODUCTION: Power testing measures an individual's rate of force development. Professionals use power tests to predict athletic performance, in both the upper and lower extremities. Limited research has been developed to test upper body power, and typically consist of implement throws to indicate power output for the upper extremities (Aussprung et al., 1995; Collins & Hedges, 1978; Cronin & Owen, 2004; Ikeda et al., 2007; Mayhew et al., 1991; Mayhew et al., 1997; Mayhew et al, 2005; Salonia et al., 2004). There are different variations of upper extremity assessments, which utilize implements such as medicine balls, net balls and softballs, and shot puts weighing anywhere from 0.9lbs to 11lbs, (Aussprung et al., 1995; Cronin & Owen, 2004; Mayhew et al., 1991; Mayhew et al., 1997) . Some assessments also involve lower extremities to aid the transfer of energy from lower extremities to upper extremities, such as the backward overhead medicine ball throw (Salonia et al., 2004). The purpose of this preliminary research is to develop normative data for a novel medicine ball test to assess upper extremity power in untrained and after 12 weeks of moderate training in college-aged individuals.

METHODS: The subjects recruited for this preliminary research included college-aged, female students. This research was approved by Western Illinois University's IRB committee. After all participants completed the Institution approved IRB consent procedures, participant's age, height, and weight were recorded (Table 1). Subjects who received injuries to the trunk and upper extremities during the course of the study, and those who missed 20% or more of the training sessions (five days) were excluded from the study. The subjects completed the seated medicine ball test prior to the first training day. The seated medicine ball throw required the participants to position their ischial tuberosities on a line on the floor, knees bent with heels on the floor. A measuring tape was outstretched in front of the participant and they were instructed to throw as straight forward as possible. The procedures for throwing was performed using a five kilogram/eleven pound medicine ball in both hands and bringing it up to chest level prior to explosively throwing the ball forward in a two-hand chest pass technique. Rocking the body slightly backward prior to the throw was allowed. After two or three practice throws the best of three test throws was recorded. Throws that were thrown with a torso rotation or primarily from one hand were disqualified. The distance for each throw was measured from the line on the floor and the closest contact of the medicine ball on the floor upon landing.

The training program consisted of 26 workouts, two workouts per week for 13 weeks, in which they performed explosive movements. Each training session began with a dynamic warm-up that included one set of 10-15 reps of the following movements: vertical jumps, medicine ball chest pass, tuck jumps, medicine ball underhand pass, ankle hops, and light snatch pulls. The training program included clean, jerk and snatch progressions and variations with some squat and core exercises. Each session included an average of four exercises of three to five sets of one to five repetitions. Intensities were gradually and progressively increased from approximately 65% up to 100% of each individual's estimated one rep maximum of the snatch, clean, and jerk. During weeks one through four loads were self-selected under the guidance of a USAW senior

level coach. Each estimated one rep maximum were calculated based upon testing during weeks five and ten.

RESULTS: The descriptive statistics of the 112 subjects are recorded in Table 1. The results from the paired sample t-test found a statistical difference between the pre-training and post-training seated medicine ball test scores (*t (109) =10.01, p < 0.05, d=0.54, r=0.26*). The researchers found a medium (*d=0.54*) and a small (*r=0.26*) effect sizes. These findings indicated that there were differences in upper extremity power output between pre-training and post-training, and the power training program had a large effect on the differences in results. Table 2 demonstrates pre-and post-training results. Both the pre- (*skewness= 0.445)* and post-training (*skewness= 0.374*) data were slightly positively skewed. The pre-training testing results were non-normal (*W=0.018*) and the post-training results followed the normal bell-shaped curve (*W=0.059).* The percentile scores of the pre-test and post-test seated medicine ball throw are demonstrated in Table 3 and performance rating in Table 4. Figure 1 demonstrates the frequency distribution of the pre-test seated medicine ball results, and Figure 2 demonstrates the post-test results.

Table 1: Descriptive statistics for college-aged females

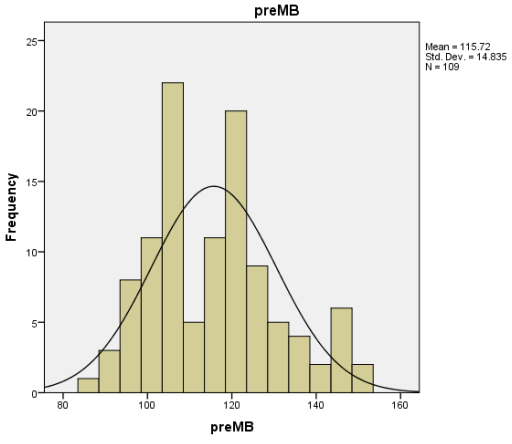
	N	Mean	Std. Deviation
Age (years)	109	20.30	4.26
Height (inches)	109	65.17	2.87
Pre-Test Weight (lbs)	109	154.76	36.63
Post-Test Weight (lbs)	109	156.62	38.50

Table 2 : Pre- and Post-Training Results

	Pre-Training	Post-Training
Mean (in)	115.72	123.94
Std. Deviation (in)	14.84	15.88
Std. Error of Mean	1.42	1.52
Sharpiro-Wilk Sig.	0.018	0.059
Skewness	0.445	0.374

Table 3: Seated Medicine Ball Throw Test Percentile Scores of Pre-Training and Post-Training

Percentile	Pre-Test Seated MB Throw (inches)	Post-Test Seated MB Throw (inches)
10th	96.00	105.00
20th	103.00	110.00
30th	107.00	115.00
40th	108.00	118.00
50th	115.00	122.00
60th	120.00	126.00
70th	123.00	132.00
80th	126.00	140.00
90th	136.00	149.00



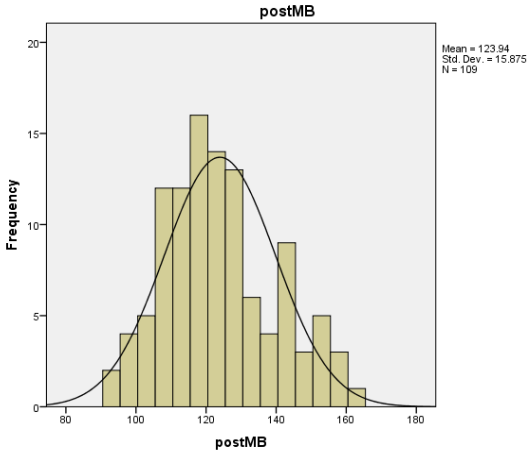


Table 4: Performance Rating Scale		
Rating	**Pre-Training (Inches)**	**Post-Training (Inches)**
Excellent	≥146.60	≥154.80
Above Average	124.70– 146.59	
Average	104.00 – 124.69	
Below Average	92.80 – 103.99	97.40 – 111.29
Poor	≤ 92.79	≤ 97.39

Figure 1: Pre-Training MB Histogram

Figure 2: Post-Training MB Histogram

DISCUSSION: The purpose of this preliminary research was to develop normative data for a novel medicine ball test to assess upper extremity power in untrained and moderately trained college-aged individuals. The percentiles and the descriptive statistics provide professionals with a performance baseline for pre- and post-power training. Even though the purpose of the study was to identify normative values for college-age students, this study also demonstrates the effects of a structured power-training program on power performance. Because there is limited research of normative upper extremity power output (Aussprung et al., 1995; Collins & Hedges, 1978; Cronin & Owen, 2004; Ikeda et al., 2007; Mayhew et al., 1991; Mayhew et al., 1997; Mayhew et al, 2005; Salonia et al., 2004), this preliminary investigation gives researchers insight regarding the power performance of college females. Additionally, this information provides strength and conditioning professionals benchmarks for their athletes.

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