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Study of kettlebell training and body weight exercises impact on maximum strength performance among female physical education students

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Abstract
The study was to investigate the 16-weeks impact of kettle bell training and own body weight exercises on maximum strength performance among female physical education students. Total N=36 (thirty-six) male physical education students recruited randomly from Dr. Varalakshmi Physical Education College. Bhavani Nagar, T.B. Vara, Srungavarapu kota, Vizianagaram Dt, A.P. and their age period ranged from 18 years to 25 years as per subject's school records. The recruited female physical education students was randomly classified into four groups each group n=12 physical education students i.e. empirical groups I physical education students underwent kettle bell training (KBPS = 12), empirical group II physical education students underwent own body weight exercises training (BWPS = 12) and control group physical education students (CTPS = 12). CTPS students were practiced only their respective specialization game. The kettle bell training and body weight exercises training period was implemented for 16- week's duration and four sessions in a week. The measurement of maximum strength scores was collected through 1 RM bench press (In Kgs) test before and after the completion of specific training methods. The collected scores were analyzed through ANCOVA and level of significant was restricted at 0.05 levels. The study found that 16-weeks impact of kettle bell training and body weight exercises resulted fruitful for significant enhancement of muscular maximum strength performance among female physical education students comparative to control group.

Keywords: Yoga, Circuit, Exercises, Drills and Basketball

Introduction
Physical education is an essential part of the educational process that focus on development of the individual through physical activities. Unlike traditional education that emphasizes intellectual growth, physical education lays emphasis on the harmonious development of the body mind and emotions. It involves systematic instruction in sports, exercise, recreation and health education to promote over all wellness and quality of life.
Strength and conditioning is the selection and implementation of dynamic/static exercises with the goal of improving athletic performance. Upper body maximal strength 1RM test is the ability of the athletes to lift maximum resistance while performing bench press. Kettle bell a weighted ball available in various weight categories with handle to perform various movement and exercises. Body weight exercises are physical exercises that uses athletes own body as weight example pushups, pull ups, burpees, mountain climber, squat etc.

Statement of the Research Problem
To investigate the "Effect of kettle bell training and own body weight exercises on maximum strength performance among female physical education students".

Objectives of this research study
1. The primary objective of this investigation is to evaluate the 16-weeks influence of kettle bell training and own body weight exercises on maximum strength performance among female physical education students.
2. The secondary objective of this research are

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- To compare the selected training methods between kettle bell training and own body weight exercises on maximum strength performance among female physical education students.
- To judge the best suitable training program among selected two training methods for enhancement of maximum strength performance among female physical education students.

Research Hypothesis

- There will be a significant increase in muscular strength in kilograms of maximum strength performance of empirical group's female physical education students after the sixteen weeks impact of kettle bell training and own body weight exercises when compared with control group basketball players.
- The kettle bell training will be more effective than the own body exercises for increasing maximum strength performance.

Methodology: The study was to investigate the 16-weeks impact of kettle bell training and own body weight exercises on maximum strength among female physical education students. Total N=36 (thirty-six) male physical education students recruited randomly from Dr. Varalakshmi Physical Education College. Bhavani Nagar, T.B. Vara, Srungavarapu kota, Vizianagaram Dt, A.P. and their age period ranged from 18 years to 25 years as per subject's school records. The recruited female physical education students was randomly classified into four groups each group n=12 physical education students i.e. empirical groups I physical education students underwent kettle bell training (KBPS = 12), empirical group II physical education students underwent own body weight exercises training (BWPS = 12) and control group physical education students (CTPS = 12). CTPS students were practiced only their respective specialization game. The kettle bell training and body weight exercises training period was implemented for 16- week's duration and four sessions in a week. The measurement of maximum strength was collected through 1 RM bench press (In Kgs) test before and after the completion of specific training methods. The collected scores were analyzed through ANCOVA and level of significant was restricted at 0.05 levels.

Table 1: Analysis of Covariance for maximum strength test - 1 RM bench press (In Kgs) of the KBPS, BWPS and CTPS groups for female physical education students

Groups	KBPS	BWPS	CTPS	SOV	Sum of squares	df	Mean Square	F' Ratio
Pretest mean	69.916	74.00	71.66	B	100.722	2	50.361	1.196^{NS}
SD	5.401	8.474	5.033	W	1389.58	33	42.109	
Posttest mean	81.583	93.33	70.833	B	241572.2	2	1519.75	70.314*
SD	5.107	2.741	5.589	W	3039.50	33	21.614	
Adjusted mean	82.595	92.543	70.934	B	2757.001	2	1378.50	16.442*
				W	526.133	32	16.442	
Mean difference	+11.667	+19.33	-0.827	-	-	-	-	-

Note: Table F-ratio value at 0.05 level of confidence for 2 and 33 (df) =2.44, 2 and 32 (df) =2.44 *Significant & NS: Not significant.

- **KBPS:** Kettle bell training female physical education students.
- **BWPS:** Own body weight exercises female physical education students.
- **CTPS:** Control group physical education female students.

The above table-I resulted that there is a significant difference on maximum strength performance among the three groups such as kettle bell training female physical education students (KBPS), own body weight exercises female physical education students (BWPS) and Control group physical education female students (CTPS). Since the 'F' value required being significant at 0.05 level for 3, 33 d/f and 3, 32 are 2.44, but the computation values of upper body maximum strength performance post and adjusted posttest 'F' values are 70.314 and 16.442 respectively. Which are greater than the tabulated value, it shows that kettle bell training and own body exercises is effective for resulting positive changes in upper body maximum strength performance of female students. Since the obtained 'F' ratio is found significant.

Table 2: The upper body maximum strength performance results of scheffe's method test mean differences between KBPS, BWPS and CTPS groups for female physical education students

KBPS	BWPS	CTPS	MD	CI
82.595	92.543	-	9.948*	6.685
82.595	-	70.934	11.661*	
-	92.543	70.934	21.609*	

Note: * Significant & NS: No significant

- **KBPS:** Kettle bell training female physical education students.
- **BWPS:** Own body weight exercises female physical education students.
- **CTPS:** Control group physical education female students.

In above table 2 presented the adjusted final mean variations between the kettle bell training female physical education students [KBPS] and body weight exercises female physical education students [BWPS], kettle bell training female physical education students [KBPS] and Control group physical education female students [CTPS] and body weight exercises female physical education students [BWPS] and Control group physical education female students [CTPS] are 9.948, 11.661 and 21.609 values are higher than calculated formula CI value 6.685. Hence evaluator recorded significant variations resulted between kettle bell training, body weight exercises and control group female physical education students after completion of training methods time period.

The prior, final and adjusted post scores results mean of the KBPS, BWPS and CTPS female physical education students groups upper body maximal strength performance presented in bar graph -I.

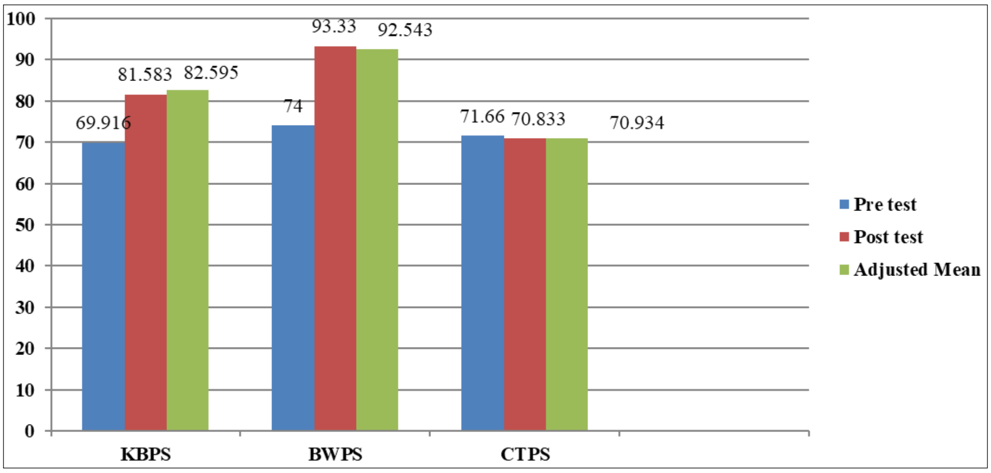

Fig 1: The upper body maximum strength pre post and adjusted posttest mean values of KBPS, BWPS and CTPS groups for female physical education students presented in bar graph

- **KBPS:** Kettle bell training female physical education students.
- **BWPS:** Own body weight exercises female physical education students.
- **CTPS:** Control group physical education female students.

Discussion on Hypothesis

- The first hypotheses stated that there will be a significant increase in muscular strength in kilograms of maximum strength performance of empirical group's female physical education students after the sixteen weeks impact of kettle bell training and own body weight exercises when compared with control group basketball players. The statistical analysis proved that kettle bell training and body weight exercises significantly increased the maximum strength performance of female physical education students. Hence research first hypothesis accepted.
- The second hypotheses stated that kettle bell training will be more effective than the own body exercises for increasing maximum strength performance. The statistical analysis proved kettle bell training is superior to own body weight exercises method. Hence research second hypotheses accepted.

Discussion and Findings

The sixteen weeks impact of kettle bell training and body weight exercises resulted constructive for increasing muscular strength performance of female physical education students. The list of experimental studies result published were refereed were found in a systematic review and meta-analysis that free-weight and machine-based strength training are effective for increasing maximal strength performance among athletes. Kaabi *et al*, (2016) [2] outcomes lead that an integrated resistance program based weightlifting exercises develop 1-RM bench press performance of their table tennis players. Ghoual (2019) [3] suggested that eight weeks of repetitions ranges resulted gain in the flat bench press maximal strength performance appeared in study that dynamic high-intensity heavy-resistance core strength training improve upper-body strength and power performance in national-level junior performance in a periodized pre-season program. Systematic review and meta-analysis suggested that resistance training and traditional resistance training are equally effective in improving maximal muscle strength in healthy adults

Conclusions

Author finally concluded that sixteen weeks of kettle bell training and body weight exercises is significantly accepted for increasing the female muscular strength performance. Hence, kettle bell training is more furtive result than own body exercises for enhancing upper body female muscular strength. Therefore, suggested to all college's physical education professional to install kettle bell equipment's in their gym for bring positive results among female athletes.

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