Abstract- The aim of the present study was to examine the combined training effects of battle rope and kettlebell training on selected physiological variables among basketball players. To achieve the purpose of the study twenty four college level male basketball players were selected randomly as subjects from Madurai Kamaraj University, Madurai, Tamilnadu, India and their age were ranged from 18 to 25 years. The basketball players were assigned at random into two groups of each twelve player (N=12). Group-I underwent combined training group and Group–II acted as control group who did not attended any special training other than their daily college schedule curriculum. The duration of the training period was restricted to eight week for three alternative days per week. The pre and post data were collected before and immediately after the training period. The selected variables such as forced vital capacity, total lung capacity and vital capacity were measured by Spiro meters test. The collected data from the two groups prior to and after the experimental treatments on forced vital capacity, total lung capacity and vital capacity were statistically analyzed by using the statistical technique of dependent-‘t’ test and analysis of covariance (ANCOVA). In all the cases 0.05 level of confidence was fixed as a level of confidence. The result of the study indicated that combined training group had shown significantly improved on forced vital capacity, total lung capacity and vital capacity among basketball players. However the control group had not shown any significant improvement on any of the selected variables such as forced vital capacity, total lung capacity and vital capacity.

Keywords- Forced Vital Capacity, Total Lung Capacity and Vital Capacity, Kettlebell, Battle Rope

I. INTRODUCTION

Basketball is an invasion team sport, dynamic and intermittent in nature, formed by fast and short displacements, where changes in speed and direction are produced and where jumps are an integral part of the game’s demands [1].

Testing physiological requirements for basketball has become more specific over the past decade with further advances in both sports science technology and general understanding of the physiological requirements for testing basketball [2].

Training is a systematic process of repetitive, progressive exercise or work involving learning process and acclimatization. The training load can be increased gradually or step by step is result in strong and faster adaptation process and more effective reaction from the organism [3].

Kettle bells are an ideal tool for ballistic, full-body exercises using high muscle forces, making them potentially useful for improving muscular strength and cardio respiratory fitness [4].

Battling rope protocols are used for a variety of training goals including increasing strength, power, local muscular endurance, and agility. It’s a challenging way to target weight loss and body fat reductions through increased energy expenditure. Also, increased cardiovascular demand could be helpful for improving maximal aerobic capacity and metabolic health [5].

The purpose of the present study was to examine the combined training effects of battle rope and kettlebell training on selected physiological variables among basketball players.

II. METHODOLOGY

A. Participants

To achieve the purpose of the study twenty four college level male basketball players were selected randomly as subjects from Madurai Kamaraj University, Madurai, Tamilnadu, India and their age were ranged from 18 to 25 years.

B. Procedures

The basketball players were assigned at random into two groups of each twelve player (N=12). Group-I underwent combined training battle rope and kettlebell training and Group–II acted as control that did not attended any special training other than their daily college schedule curriculum. The duration of the training period was restricted to eight week for three alternative days per week.
C. Variables and Measurement

The pre and post data were collected before and immediately after the training period. The selected variables such as forced vital capacity, total lung capacity and vital capacity were measured by Spiro meters test.

D. Statistical Analyses

Data analysis were performed by using dependent ‘t’ test and analysis of covariance (ANCOVA). In all the cases the level of confidence was fixed at 0.05 significant.

III. ANALYSIS OF DATA

<table>
<thead>
<tr>
<th>Criterion variables</th>
<th>Mean</th>
<th>Combined Training</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced Vital Capacity</td>
<td>Pre test</td>
<td>4.23</td>
<td>4.21</td>
</tr>
<tr>
<td>Post test</td>
<td>4.42</td>
<td>4.24</td>
<td></td>
</tr>
<tr>
<td>‘t’-test</td>
<td>10.24*</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Total Lung Capacity</td>
<td>Pre test</td>
<td>5.33</td>
<td>5.32</td>
</tr>
<tr>
<td>Post test</td>
<td>5.41</td>
<td>5.35</td>
<td></td>
</tr>
<tr>
<td>‘t’-test</td>
<td>8.03*</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Vital Capacity</td>
<td>Pre test</td>
<td>4.41</td>
<td>4.44</td>
</tr>
<tr>
<td>Post test</td>
<td>4.74</td>
<td>4.47</td>
<td></td>
</tr>
<tr>
<td>‘t’-test</td>
<td>11.46*</td>
<td>1.03</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level. (Table value required for significance at .05 level for ‘t’-test with df 11 is 2.20)

From the table I the dependent ‘t’-test values of forced vital capacity, total lung capacity and vital capacity between the pre and post tests means of experimental groups were greater than the table value 2.20 with df 11 at 0.05 level of confidence, it was concluded that the experimental group had significant improvement in the forced vital capacity, total lung capacity and vital capacity between while compared to control group.

A. Computation of Analysis of Covariance

The descriptive measures and the results of analysis of covariance on the criterion measures were given in the following tables.

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced Vital Capacity (Adjusted Post Mean)</td>
<td>4.44</td>
<td>4.23</td>
<td>BG</td>
<td>1.15</td>
<td>1</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WG</td>
<td>1.47</td>
<td>21</td>
<td>0.07</td>
</tr>
<tr>
<td>Total Lung Capacity (Adjusted Post Mean)</td>
<td>5.40</td>
<td>5.36</td>
<td>BG</td>
<td>0.326</td>
<td>1</td>
<td>0.326</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WG</td>
<td>0.504</td>
<td>21</td>
<td>0.024</td>
</tr>
<tr>
<td>Vital Capacity (Adjusted Post Mean)</td>
<td>4.75</td>
<td>4.46</td>
<td>BG</td>
<td>2.24</td>
<td>1</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WG</td>
<td>1.89</td>
<td>21</td>
<td>0.09</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level. Table value for df 1, 21 was 4.32.

The above table indicates the adjusted mean value on forced vital capacity; total lung capacity and vital capacity of combined training group and control group were 4.44 & 4.23, 5.40 & 5.36 and 4.75 & 4.46 respectively. The obtained F-ratio of 16.43, 13.58 and 24.86 for adjusted mean was greater than the table value 4.32 for the degrees of freedom 1 and 21 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among combined training group and control group on forced vital capacity, total lung capacity and vital capacity.
IV. DISCUSSION ON FINDINGS

The findings of this study had clearly revealed that the combined training effects of battle rope and kettlebell training shows positive changes on selected physiological variables among basketball players. When the exercises were done regularly during the battle rope and kettlebell training programme for 8 weeks, the subject should have improved all selected physiological variables such as forced vital capacity, total lung capacity and vital capacity. The consistency is determining the significant contribution of combined battle rope and kettlebell training on developing the dependent variables in this study was similar to the findings of other following studies. Chittibabu & Akilan, (2013) evaluated the study on effectiveness of a basketball specific endurance circuit training on aerobic capacity and heart rate of high school male basketball players. That study was concluded that basketball specific endurance circuit training is effective in improving aerobic capacity and increases the cardiovascular fitness of male high school boys during competitive phase. Conte, Favero, Niederhausen, Capranica & Tessitore, (2016) conducted the study on the effects of two factors (number of players and training regimes) on player’s physiological and technical demands in basketball ball-drills. This study showed that both number of players and regime are useful variables able to modify basketball ball-drills workload. Falatic, Plato, Holder, Finch, Han & Cisar, (2015) examined the effects of a kettlebell training program on aerobic capacity. Thus, kettlebells can be used as a training modality within a high-intensity interval training program to improve aerobic capacity in female collegiate soccer players.
Parasuraman & Mahadevan, (2019) evaluated the isolated and combined effects of kettlebell and battle rope training on selected physical physiological psychological and performance variables among inter collegiate volleyball players. It was concluded that, combined training group have produced better subsequent improvement than the isolated kettlebell training group and isolated battle rope training group on selected physical, physiological and psychological and performance variables among Intercollegiate volleyball players. And also it concluded that, isolated battle rope training and isolated kettlebell training also have produced better have subsequent improvement than the control group on all selected variables among Intercollegiate volleyball players. Vigneshwaran & Arumugam, (2015) conducted the study on impact of kettle bell training on selected performance variables among soccer players. Arumugam, Muniyandi & Suriya, (2020) conducted the study on effect of aqua aerobics training on selected physiological variables among school students. Arumugam & Mariammal, (2017) evaluated the study on effect of parcours training on muscular endurance and vital capacity among football players. From above those supportive studies the researcher intent to conduct this study, the result of my study also indicates that there was a significant changes on forced vital capacity, total lung capacity and vital capacity due to the combined effect of battle rope and kettlebell training among basketball players when compared to control group.

V. CONCLUSIONS
1. There was significant improvement on forced vital capacity due to the combined training effects of battle rope and kettlebell training among basketball players.
2. There was significant improvement on total lung capacity due to the combined training effects of battle rope and kettlebell training among basketball players
3. There was significant improvement on vital capacity due to the combined training effects of battle rope and kettlebell training among basketball players.
4. There was a significant difference exists between experimental and control groups on selected dependent variables such as forced vital capacity, total lung capacity and vital capacity due to the combined training effects of battle rope and kettlebell training among basketball players.
5. However the control group had not shown any significant improvement on any of the selected variables.

REFERENCES