The comparison of left-handed vs. right-handed player via using additional weighting on development of explosive strength and speed strength and electrical some of the upper extremities for the attack serve in volleyball players

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ABSTRACT
Training methods are basic and main instrument of the influence on physical and skill levels as well as training by additional weighting is a training style which assists to approach to maximum degree of effectiveness via using strength. The purpose of this study was to determine whether there are differences in explosive strength, speed strength, and electrical upper extremities gains for the attack serve in left-handed and right-handed volleyball players between ten weeks of additional weighting training. A secondary purpose was to determine whether differences in gains were observed at a larger rate between left-handed and right-handed. Ten college-aged volleyball players were split into the groups based on gender and pre-training performance measures. Work was equated between the two groups. After 10 weeks of additional weighting training, both groups significantly improved their explosive strength, speed strength, and electrical upper extremities following 10 weeks of training. However, first experimental group improved significantly better than the other. The results of this study suggest that performing 10 weeks of additional weighting training is effective for improving explosive strength, speed strength, and electrical upper extremities; thus, coaches should choose the program which best suits their training schedules.

Keywords: Left-handed, right-handed, additional weighting, explosive strength.

1. Introduction
During the last few years, growing attention has been drawn to muscles electrical as a modality for explosive strength and speed strength training in highly trained players (Delitto et al., 1989; Eriksson et al., 1981; Newton et al., 1999). Actually, increasing evidence indicates that high frequency additional weighting training essentially increases maximal voluntary contraction of the upper limb muscles during open kinetic chain efforts (Martin, et al., 1993).
For instance, long-term (12-week) protocols have been reported to increase explosive strength and speed strength of the elbow extensor muscles and rest flexor (Ammar., 2010). Predictable explained by alteration in the function of the nervous system (e.g., increased activation) (Maffiuletti, et al., 2002).

In most sports, the ability to successfully achieve explosive tasks is depend on strength and power, otherwise, speed strength tasks is based on strength and speed. Strength is the increase of force whereas power is force development per unit of time (Fleck and Kraemer, 2004; Hammed, 2011). Many training methods exist that try to rise player’s speed and muscular power. Most commonly, these methods include of some form of either resistance (additional weighting) or plyometric (throwing) training. Researchers have investigated the effects of both of these forms of training exclusively and in combination on factors such as vertical jump, hip and thigh power, (Adams et al., 1992).

Whether or not such additional weighting training prompted neural, explosive strength, and speed strength adaptations can positively affect closed kinetic chain actions, such as the attack serve in volleyball still remains unanswered. Only one research has studied whether muscle electrical and explosive strength training had an effect on vertical jump performance in volleyball (Ahmad., 2011). This author described that muscle electrical and explosive strength training of the thigh muscles significantly improved squat jump performance in a group of volleyball players; however, counter movement jump height significantly improved only after an additional month of standardized volleyball training.

Therefore, it appears that additional weighting training for left-handed and right-handed should be followed by a short period of sport-specific (e.g., volleyball workout and competition) in order to take full benefit of the improved electrical muscle and explosive strength, in addition to speed strength. These findings look to support the claims of Ebbens and Watts (1998) who report that additional weighting training, a form of resistance training in which the workload placed on the muscles is of substantial demand, is known to improve muscular strength. By increasing resistance, there is a greater recruitment in upper muscle fibers leading to increased force production in volleyball players.

Over time, there building of these muscle fibers increases explosive strength and speed strength development. However, training by using additional weighting has been shown to improve muscular power and speed strength. While increases in explosive strength and speed strength in left-handed and right-handed players due to training by additional weighting tend to reflect changes in the force component, improvements in power, and changes in neuromuscular response (Adams et al., 1992). Mainly the speed component is increased in the attack serve because of improved of the central nervous system.

Even though explosive strength and speed strength production of the upper limb muscles is an important neuromuscular performance characteristic among volleyball players, very few studies have been conducted to determine the most appropriate training program for the improvement of attack serve ability during the preseason training period. However, our study aimed to determine whether there are differences in explosive strength, speed strength, and electrical upper extremities gains for the attack serve in left-handed and right-handed volleyball players between ten weeks of additional weighting training. A secondary aim was to determine whether differences in gains were observed at a larger rate between left-handed and right-handed.
2. Methodology

The researchers have used the experimental method of a couple experimental groups.

2.1 Subjects

The subjects in this study were volunteers from the Men’s Volleyball players at the specific school of volleyball\ Iraq- Baghdad. 10 Males from the ages of 16-17 were divided into two groups table (1) shows homogeneity of the subject. The groups consisted of a left-handed group and a right-handed group. Each group consisted of 5 participants. These subjects were asked to volunteer for the study after the investigator informed them of their expectations. All players had trained and competed regularly in volleyball for at least 3 years. They approved to contribute in the study on a voluntary basis and signed an informed-consent form. The study was approved by the University of Baghdad.

![Table](1)

**Shows homogeneity of the subject**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Skewness Coefficient</th>
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<td>Cm</td>
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<td>4.36</td>
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<td>0.73</td>
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<tr>
<td>Weight</td>
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<td>54</td>
<td>0.81</td>
</tr>
<tr>
<td>Age</td>
<td>Year</td>
<td>16.18</td>
<td>0.93</td>
<td>16</td>
<td>0.54</td>
</tr>
</tbody>
</table>

2.2 Measurements:
1. Arm explosive strength test.
2. Arm speed strength test.
3. Attack serve test.
4. EMG test.

2.3 Pre-Training Testing Procedures

The week prior to training, subjects came to the entire hall of Al-Karkh center and performed their pre-training testing that consisted of arm explosive strength, arm speed strength, attack serve, and EMG tests. This initial week, between the warm up and recorded tests, they were asked to perform three maximal “practice” each test to become comfortable using the equipment. Once completed, the subject rested for 3minutes and then began testing. The tests were achieved on April 20, 2013.

2.4 Training Program

Training for the left and right-handed groups began the following week. Additional weighting exercises for both groups were conducted according to existing literature, the intensity for all exercises was optimal for the development of explosive strength and speed strength as subjects performed 3 sessions per week; 120 minutes per session, which were supervised by the same coach, i.e., one of the authors. Also, one friendly match was played every week. The typical volleyball session was divided into warm-up, main, and recovery periods. The warm-up lasted ;20 minutes and included jogging at increasing velocities, sub maximal contractions of the upper-body muscles (e.g., crunches, pull-ups, push-ups), sub maximal jumps and both upper-and lower-body stretches. The main part of the session included on-court skills training (attacking and defensive fundamentals, technical workouts, and special situations) and actual game play.
The work/rest ratio was close to 2:1. None of the subjects completed specific weight training for the upper limb muscles during the 74-day experimental period. Subjects were informed to perform both explosive strength and speed strength as possible with high speed contractions. All resistance exercises were performed using additional weights. The Sets/Reps protocol was based on previous study (Trifoliate al., 2005). Rest periods between sets lasted 60 seconds, whereas rest periods between exercises lasted 2 minutes (Fleck & Kraemer, 2004).

2.5 Post-Training Testing Procedures
The post training tests were conducted the eleven week following training protocol on July 1, 2013 with the same steps in the pre-test.

2.6 Statistical analysis
Regular statistical methods were used to calculate means, standard deviations (SDs), and independent and dependent T-test to assess the effect of additional weighting training between pre and post-tests. The level of significance was established at $p \leq 0.05$ for all procedures.

3. Results & Discussion
The aim of this study was to determine if an additional weighting training is producing gains in speed strength, explosive strength, large chest muscle, and deltoid muscle performances. A secondary aim was to determine whether differences in gains were detected at a larger rate between left-handed and right-handed. Ten male volleyball players participated in this study. Five males were assigned to the left-handed training group while 5 males were assigned to the right-handed training group. All subjects were tested the week prior to training.

Significant changes of left-handed group in speed strength, explosive strength, large chest muscle, and deltoid muscle performances were observed after 10 weeks of additional weighting training (Table2, pre to post), while the mean speed strength and the mean explosive strength and the mean large chest muscle (area of under curve and highest electrical), and deltoid muscle (area of under curve and highest electrical) tests significantly increased, by 13.8,12.1, 760, 115.60, 913.02, 1680.3, respectively.

Table (2)
Shows pre and post-tests of left-handed group

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure Unit</th>
<th>Pre-tests</th>
<th>Post-tests</th>
<th>T-test</th>
<th>Significant</th>
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<tr>
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<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.81</td>
<td>0.31</td>
<td>13.8</td>
<td>0.78</td>
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<td>explosive strength</td>
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<td>0.62</td>
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<td>0.76</td>
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<tr>
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<td>area of under curve</td>
<td>443</td>
<td>92.01</td>
<td>760</td>
<td>80.03</td>
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<tr>
<td></td>
<td>highest electrical</td>
<td>850.16</td>
<td>201.3</td>
<td>115.60</td>
<td>317</td>
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<tr>
<td>deltoid muscle</td>
<td>area of under curve</td>
<td>315.01</td>
<td>108.2</td>
<td>913.02</td>
<td>130.05</td>
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<td></td>
<td>highest electrical</td>
<td>1120.8</td>
<td>1860.1</td>
<td>1680.3</td>
<td>3180.21</td>
</tr>
</tbody>
</table>

T-test value (2.78).
Significant changes of right-handed group in speed strength, explosive strength, large chest muscle, and deltoid muscle performances were detected after 10 weeks of additional weighting training (Table 3, pre to post), while the mean speed strength, explosive strength, the mean large chest muscle (area of under curve and highest electrical), and deltoid muscle (area of under curve and highest electrical) tests significantly increased, by 13.1,11.9, 710, 1100.60, 891.03, 1321.1 respectively.

Table (3)
Shows pre and post-tests of right-handed group

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure Unit</th>
<th>Pre-tests</th>
<th>Post-tests</th>
<th>T-test</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>speed strength</td>
<td></td>
<td>8.32 0.40</td>
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<td>explosive strength</td>
<td></td>
<td>8.91 0.68</td>
<td>11.9 0.68</td>
<td>4.17</td>
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<tr>
<td>large chest muscle</td>
<td>area of under curve</td>
<td>411 83.01</td>
<td>710 79.01</td>
<td>9.21</td>
<td>S</td>
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<tr>
<td></td>
<td>highest electrical</td>
<td>815.11 201.3</td>
<td>1100.60 299</td>
<td>6.17</td>
<td>S</td>
</tr>
<tr>
<td>deltoid muscle</td>
<td>area of under curve</td>
<td>310.01 100.1</td>
<td>891.03 128.1</td>
<td>8.97</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>highest electrical</td>
<td>1110.1 172.5</td>
<td>1321.1 246.11</td>
<td>8.012</td>
<td>S</td>
</tr>
</tbody>
</table>
| T-test value (2.78).

Speed strength, explosive strength, large chest muscle, and deltoid muscle performances were significantly higher for left-handed group than right-handed group (Tabulate T-test = 2.31, p <0.05) left-handed group averaged speed strength13.8 higher than right-handed, while in the left-handed group averaged explosive strength0.76 higher than right-handed. There was however, significant difference in the large chest muscle, and deltoid muscle tests between two groups in favor of left-handed group table (4) shows post-tests of both groups.

Table (4)
Shows post-tests of both groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure Unit</th>
<th>Left-handed group</th>
<th>Right-handed group</th>
<th>T-test</th>
<th>Significant</th>
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<tr>
<td>speed strength</td>
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<td>13.8 0.78</td>
<td>13.01 0.81</td>
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<td>S</td>
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<tr>
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<td>12.1 0.76</td>
<td>11.9 0.68</td>
<td>5.74</td>
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<tr>
<td>large chest muscle</td>
<td>area of under curve</td>
<td>12.63 0.61</td>
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<tr>
<td></td>
<td>highest electrical</td>
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<tr>
<td>deltoid muscle</td>
<td>area of under curve</td>
<td>1150.60 317</td>
<td>1100.60 299</td>
<td>5.61</td>
<td>S</td>
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<tr>
<td></td>
<td>highest electrical</td>
<td>913.02 130.05</td>
<td>891.03 128.1</td>
<td>8.44</td>
<td>S</td>
</tr>
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</table>

Tabulate T-test = 2.31. Error degree= 0.05.
The main findings of the study indicated that a 10-week additional weighting training program, merged into the preseason volleyball training, significantly increased the mean speed strength and explosive strength for both groups. The data also showed that, following the additional weighting training program, 10-week of standardized volleyball training significantly enhanced large chest muscle and deltoid muscle performance by 4–5%. Giving to previous examination (Ahmad, 2011), additional weighting training may be a suitable way for developing explosive strength and speed strength, such as attack serve. Volleyball attack serve practice needs a short but high intensive effort, i.e., maximal ball shot, that is achieved repetitively during both competition and training. Ammar, (2010) have detected that, during a volleyball match, each time a player ball shot once or more, with a mean recovery of 15 seconds between shots.

However, while explosive strength and speed strength production during attack serve is an important neuromuscular performance characteristic among volleyball players, the usefulness of additional weighting training program for the improvement of such ability has not been assessed systematically. Adel, (2011) have recently shown that 10 weeks of traditional weight training for left and right-handed had no effect in explosive strength for both group. In addition, all subjects finalized the usual preseason volleyball preparation with 3–4 training sessions per week.

Different results were seen in the current study, with the exceptions that the training program was (10 weeks with additional weighting), subjects were younger, and significant gains in all tests of the study for both groups left and right-handed were observed, but left-handed players were the best in results after long period (10 weeks) of additional weighting training. This means that left-handed players are thinking faster than right-handed players through training and competition time due to left-handed uses two halves of brain whereas right-handed uses one half of brain for thinking.

Many of previous investigations confirm that while left-handed players are clever in mathematics and all kinds of physical educational, right-handed players are less ingenious (Talha, 2001). However, the high of change in variables of the study following the completion of the additional weighting training program is a novel finding because no study have observed this finding. In the current study, both chest and deltoid muscles were concomitantly stimulated because their relative contribution to the total work produced during attack serve has been suggested to average 4.81, 9.37, 5.61, and 8.44 respectively. To the best of our knowledge, the effects of additional weighting training on explosive strength, speed strength, and electrical upper extremities gains for the attack serve performance in left-handed and right-handed volleyball players have never been studied previously.

4. Conclusion

The results of this study suggest that performing 10 weeks of additional weighting training is effective for improving explosive strength, speed strength, and electrical upper extremities in both groups. Furthermore, left-handed showed to be better than right-handed on improving explosive strength, speed strength, and electrical upper extremities. Specific training programs such as additional weighting training should be recommended to volleyball players in order to develop their explosive strength and speed strength abilities. As a practical recommendation, it is suggested that additional weighting training could be used to enhance explosive strength and speed strength performance without meddling with sport-specific volleyball training and would be best used early in the volleyball training season.
Additional weighting training provides an advantage over resistance training for improving attack serve ability and electrical upper extremities when time availability for physical conditionings limited. Indeed, 120 minutes of additional weighting training per week during 10 weeks of volleyball training resulted in significant increases in explosive strength and speed strength abilities and electrical upper extremities for our subjects. Resistance training protocols usually require more than 90 minutes per week, however, it must be kept in mind that additional weighting training does not have an immediate positive effect. Future research is necessary to replicate these findings and determine the influence of concomitant additional weighting training on vertical jump ability and electrical lower extremities for left and right-handed players in team sports like volleyball. Also, the mechanisms responsible for “delayed” explosive strength and speed strength increases in left and right-handed following additional weighting training and the possible involvement of neural adaptations remain to be carefully identified. Thus, coaches should choose the program which best suits their training schedules.

References


