The effect of one and two-handed backhand strokes on hand-eye coordination in tennis

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Abstract

The purpose of this study was to investigate the effect of one and two handed backhand tennis practice on hand-eye coordination in tennis. Twenty three subjects (21.51±1.36 years old) voluntarily participated in study and assigned into two tennis training conditions in random order: training with one-handed (OH) backhand strokes (n=11) and training with two-handed (TH) backhand strokes (n=12). Tennis technical practices were given to all subjects during four weeks (twice a week, 2 hours per day). The subjects were evaluated with Two Hand-Eye Coordination Test (THECT) and Tennis Ability Test (TAT). The tests were carried out at the beginning (4th hour) and the end of the study (16th hour). As a results, there were no significant differences between OH and TH groups in TAT at pre (OH=41.56±19.18; TH=39.61±16.95 % points; p=0.84) and post (OH=70.46±14.25; TH=62.73±20.53; p=0.34) tests. Moreover, in THECT there were no significant differences between OH and TH groups at pre (OH=42.45±8.44; TH=42.90±11.28; p=0.92) and post (OH=29.34±5.31; TH=33.39±11.61; p=0.33) tests. Although there were significant differences between pre and post test of OH group in TAT (p=0.01), there were no similar significance in TH group (p=0.11). There were significant differences in THECT between pre and post tests in OH (p=0.00) and TH (p=0.00) groups. According to these results, two handed backhand stroke does not more effective than one handed back hand stroke, considered of targeting in tennis and two hand-eye coordination abilities.

Keywords: Tennis; backhand; strokes; coordination.

1. Introduction

Tennis requires many different characteristics such as neuromuscular power, strength, endurance, agility, balance and hand-eye coordination (Filipčič et al., 2010). Moreover, hand-eye coordination has key role to success in tennis (Iacoboni, 2001). Two important classifications are mentioned in motor control and learning, one of them is discrete, continuous and serial skills and the other is open versus closed skills (Schmidt et al., 2005). As it is known that tennis is an open skill sport (Magill, 1993) demands physical and mental skills and excellent physical conditioning (Ochi et al., 2009). Open skill sports require unpredictable environmental situations (Coker, 2004) like in tennis (Schmidt et al., 2005), because a tennis player struggle to make out, where I can hit the ball. Due to the nature of the tennis game, complex motor movements need high level of coordination between legs, hands and eyes
(Malliou et al., 2010). Enhanced muscular coordination may contribute to develop performance of tennis players (Rota et al., 2012).

2. Material and Methods

2.1. Participants

Thirty three healthy volunteers participated in the study. Subjects provided informed written consent to participate in the study. All participants were right handed. None of them had played or learned tennis before. The method of the experiment and the aims were explained but information was not provided about the variables to be evaluated.

Before pre-test, subjects were randomly divided into two groups, the One Hand stroke group (OH, n=11) and the Two Hand stroke group (TH, n=12). Receive subjects approval, one hand stroke was taught as back hand technique for willing subjects.

2.2. Training procedure

Tennis technical practices were given to all subjects during four weeks (twice a week, 2 hours per day). Practices for all group was designed same intensity, repetition and size. The only difference between two groups was type of back hand strokes. OH group practiced just one hand strokes for all back hand trials. Besides, the other group (TH) hit the balls with both hands.

2.3. Test procedures

2.3.1. Tennis Ability Test (TAT)

The purpose of this test was to measure tennis targeting ability. A tennis racquet and thirty (approximately) tennis balls of the same standards were used during the test. The subjects were asked to stand on base line of the tennis court. Eleven tennis balls were thrown to the subjects’ left and right sides by tester situated other side of the court (center). All balls were thrown same standard. The subjects were required to stroke the balls alternately as forehand and backhand. It was evaluated as one point when the ball hit the service areas of the other court; two points when the balls hit between the base line and service line; and zero point when the ball hit outside of the lines (single court) or into the net. This test was conducted as two sets and the best score was recorded by percentage.

2.3.2. Two-hand eye coordination test (THECT):

The purpose of this test was to measure two-arm coordination. Subjects were first instructed on the aims of the test. The apparatus composed of a tracing board with a black star pattern and a stylus. The goal of the test was to manipulate the stylus on the black star pattern. The stylus was manipulated by moving the handles. The test, which was comprised of two different consecutive operations, was tracing a star in a clockwise direction and in a counterclockwise direction. The time for task completion was recorded with a stop watch. Total time of consecutive operations was recorded (LafayetteInstruments, 2004).

2.4. Statistical method

Primarily descriptive statistical analysis was conducted to evaluate age, weight and height of the subjects. Paired-sample t-test was applied to compare pre and post tests measured of participants. And also, independent t test was carried out to evaluate differences between OH and TH groups in pre- and post-tests.
3. Results

Table 1 shows summary statistics based on age, weight and height of subjects.

Table 1: General characteristics of the subject.

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>n=23</td>
<td>(M±SD)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>21.51±1.36</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>65.35±12.75</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>172.43±8.67</td>
</tr>
</tbody>
</table>

Table 2 presents the results of paired sample t-test performed to compare the Tennis Ability Test performance of subjects and performance changing of the Tennis Ability Test percentage. According to findings, there were significant differences between pre and post tests in OH group (P<0.05) but there were no significant differences in TH group (P>0.05).

Table 2: Within group comparisons tennis ability test

<table>
<thead>
<tr>
<th>TAT (%)</th>
<th>Pre-test (M±SD)</th>
<th>Post-test (M±SD)</th>
<th>Change %</th>
<th>Difference of tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH</td>
<td>44.70±18.94</td>
<td>75.76±14.84</td>
<td>31.06</td>
<td>-3.69, 0.01</td>
</tr>
<tr>
<td>TH</td>
<td>39.09±18.35</td>
<td>68.18±17.01</td>
<td>29.09</td>
<td>-2.04, 0.11</td>
</tr>
</tbody>
</table>

In THECT test (table 3), there were positive significant differences between pre and post tests for both groups (P<0.01).

Table 3: Within group comparisons of two hand-eye coordination test

<table>
<thead>
<tr>
<th>THECT (msc)</th>
<th>Pre-test (M±SD)</th>
<th>Post-test (M±SD)</th>
<th>Change %</th>
<th>Difference of tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>t_{(pre-post)}</td>
</tr>
<tr>
<td>OH</td>
<td>42.63±8.93</td>
<td>28.18±4.08</td>
<td>33.90</td>
<td>5.92,        0.00</td>
</tr>
<tr>
<td>TH</td>
<td>44.13±11.23</td>
<td>30.77±9.48</td>
<td>30.27</td>
<td>4.13,        0.00</td>
</tr>
</tbody>
</table>

In Tennis Ability Test (table 4) and THECT (table 5), there were no significant differences (P>0.05) between OH and TH groups, both pre and post tests.

Table 4: Between group comparison of tennis ability test
Table 5: Between group comparison of Two hand-eye coordination test

<table>
<thead>
<tr>
<th>Group</th>
<th>OH (M±SD)</th>
<th>TH (M±SD)</th>
<th>Difference of groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>41.56±19.18</td>
<td>39.61±16.95</td>
<td>t_{OH-TH}=0.20, p_{OH-TH}=0.84</td>
</tr>
<tr>
<td>Post-test</td>
<td>70.46±14.25</td>
<td>62.73±20.53</td>
<td>t_{OH-TH}=0.98, p_{OH-TH}=0.34</td>
</tr>
</tbody>
</table>

4. Discussion

Results also indicate that in THECT, both groups were affected from tennis practices in a similar manner within 4 weeks. The tennis technique practices during 4 weeks may have influenced hand-eye coordination improvement positively.

On the average, OH group significantly improved (P<0.0) more than TH group (P>0.05) on Tennis Ability Test into 4 weeks. The reason of this difference, with single hand stroke may be more easily learned by the double handed strokes. Probably, if they had practiced strokes more than 4 weeks, their improvement of TAT score could have been better for each group as well.

It is known that coordination of eye-head movement, arm and hand movement in space, manipulation and postural control can influence of manual dexterity (Pennathur et al., 2003). Some top-level tennis players accomplishedly use the double handed back hand strokes (Hohm, 1987). Notwithstanding, some players prefer to use single handed backhand (Muhammad et al., 2011). The question of which backhand stroke is more effective still being discussed. Selection of single or double handed backhand strokes of players depend on success of his or her strokes (Reid et al., 2002).

The present study focused on the influence of the one or two handed backhand stroke trails on the hand-eye coordination. The main results showed that practicing with single or double handed backhand strokes may help to improve hand-eye coordination.

References


