Quantitative Assessment of Balance Ability Between Tennis Players And Non-Athletes

Ching-Cheng Chiang, Jinn-Yen Chiang\textsuperscript{1} and Tzuy-Yuang Shiang\textsuperscript{2}
Chang Gung Institute of Nursing, Taiwan
\textsuperscript{1}China Medical College, Taiwan
\textsuperscript{2}National College of P. E. & Sports, Taiwan

INTRODUCTION: Balance is a very important factor for athlete talent identification since muscle can create adequate power and strength in balance during human movement. Postural control training is more important for people who are visually impaired, those patients affected by cerebrovascular accident as well as for the elderly. In addition, balance ability is essential for top gymnasts to reach peak performance in competitions. Lord (1996) reported that exercise could significantly improve dynamic postural stability in older persons and has elucidated some possible mechanisms by which such improvements may be mediated. Several previous studies have compared the ability of balance between older people with stroke, those with Parkinson’s disease and unaffected older people. Aiming at the insufficient research comparing between athletes and non-athletes. Therefore, this initial study investigated the difference of balance ability between the tennis players and non-athletes.

METHODS: The subjects included two groups: the tennis players group that consisted of ten male tennis players (mean age 21.3 ± 1.8 years) and the group consisting of ten non-athletes (mean age 20.8 ± 1.5 years). Exclusion criteria were history of severe heart disease, vertigo, epilepsy, and total hip replacement. The investigation is divided into two main sections: static balance test (SB) and dynamic balance test (DB).

The static balance test: The balance system consists of an inherently unstable circular platform supported at its central point on a small pivot. The stability of this platform is controlled by varying the pressure in a toroid pneumatic bladder, which rests between the platform and the base of the unit. The platform is instrumented with a two-axis electrolytic tilt sensor fixed at the anterior edge of the circular platform (Figure 1). Each subject stood in the standard Romberg position (feet together) on a K.A.T. 2000 balance platform lasts 20 seconds (Figure 2). Following a one-minute familiarization period, the subject, watching a computer screen, tried to maintain a red “crosshairs” at the origin of the X-Y plane in the center of a target, while keeping the platform as steady as possible for the three trials (K.A.T. User’s Guide). The test pattern places a stationary “target” in the center of the testing display. Scoring of the data acquired during a test was calculated by measuring the distance from the tilted position (or “crosshairs”) to the reference position (or “target”). The absolute values of these distances are then summed up over the duration of the test period for each of nine Partial Balance Indexes (PBIs). The nine PBIs are illustrated in Figure 3. The sum of the PBIs yields the Balance Index (BI).
The dynamic balance test: This test pattern moves a “target” around the center of the testing display in a clockwise direction. The subject should be allowed to practice following the “target” before the test is begun. The test lasts 20 seconds (two revolutions). At the end of the test, a scoring screen appears. A sample dynamic test scoring screen is shown in Figure 4. All data was calculated by K.A.T. 2000 software. T-test was used to examine statistical differences between two groups with significant level at 0.05.
RESULTS AND DISCUSSION: The results of the both static and dynamic balance tests are listed in table 1. In the static balance test, the SBI of tennis players group was significantly smaller than the non-athletes group ($p < .05$), which indicated that tennis players have better static balance ability than non-athletes. This result suggested that regular sport training could significantly enhance the static balance ability. There is an agreement between current work and Lord’s study (1996). Lord suggested that regular exercise is essential for both healthy non-athletic persons and patients with disease. As a balance training system, the K.A.T. was found to be very effective because it allowed subjects to receive feedback pertaining to their stability performance via the K.A.T. pressure reading (p.s.i.). In clinical application, measuring balance index by using K.A.T. platform is an effective and reliable way to assess balance ability which is in agreement with other studies (France, E.P.1992).

In the dynamic balance test, there was also a significant difference in the balance index between the two groups ($p<.05$). Most tennis techniques are aimed at keeping balance themselves when they play ground stroke or serve, a skill that requires high postural control ability in dynamic situations. This finding is not too surprising considering that tennis players are frequently involved in activities such as Smash during competition and training.
Table 1  Means, Standard Deviations, and T-test Results for Balance Tests of Tennis player Group and Non-athlete Group. (n = 10)

<table>
<thead>
<tr>
<th>Balance tests</th>
<th>Tennis players (M± S.D.)</th>
<th>Non-athletes (M± S.D.)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static balance test</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Static balance index</td>
<td>130.5± 42.8</td>
<td>445.2± 127.3</td>
<td>3.73</td>
<td>.000 *</td>
</tr>
<tr>
<td>Dynamic balance test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic balance index</td>
<td>626.5± 104.3</td>
<td>1103.5± 173.8</td>
<td>2.51</td>
<td>.004 *</td>
</tr>
</tbody>
</table>

*P < .05

REFERENCES: