Investigation of the Effects of Intensive One-Sided and Double-Sided Training Drills on the Postures of Basketball Playing Children

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Abstract. [Purpose] This study aimed to investigate the effects of upper extremity-oriented intensive one-sided and double-sided dribbling on the postures of basketball playing children during the period of their basic training. [Subjects] Forty male children registered for a summer basketball training course held in Isparta, Turkey, voluntarily participated in the study. [Methods] The children were formed into two equal groups: a single dribbling group, and a double dribbling group. Both groups were subject to daily training for 1.5 hours during a period of 10 weeks. Anterior and lateral posture were analysed before and after the training period. Symmetrical differences were studied in the anterior analysis, while angular ones were examined in the lateral one. [Results] Before the training period, no significant differences were found between the two groups in either the anterior or lateral posture tests (p>0.05). Following the training, however, a significant difference with regard to shoulder and chest regions was observed between the groups in the anterior analysis (p<0.05). On the other hand, there was no significant difference in the post-training lateral test results (p>0.05). [Conclusion] Intensive one-sided dribbling training was thus observed to be effective in the asymmetrical formation of the dominant one-sided shoulder and chest regions of basketball playing children. In accordance with these data, rather than one-sided dribbling exercises, double-sided dribbling ones are recommended, because this can be said to be more beneficial for the children’s posture.

Key words: Basketball, Posture Analysis, Intensive Training

INTRODUCTION

Daily sports activity widely affects a person’s physical, physiological, mental, psychological and biomotor characteristics. However, because every type of sport has differences in the successful philosophy, mental form (tactical understanding) and technical structure, the characteristics of sportsmen and women vary across sports1-2). In particular, intensive training from an early age has a significant influence on physical development (posture and anthropometric structure)3). Posture is a composite of the positions of all the joints of the body at any given moment. Static postural alignment is best described in terms of the positions of the various joints and body segments. However, posture may also be described in terms of muscle balance4, 5). Body symmetry can be deformed by weaknesses and shortening of the muscles providing body balance, which can then cause health problems. In particular, the form of the physical symmetry of the body can be affected by

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heavy loading on one side only\(^6\). In basketball, basic technical training of the dominant side can result in a weakness of the non-dominant side. For example, imbalances in shoulder heights are frequently seen in basketball players\(^7\). In this study, the standard (good) and bad postures were taken as criteria. The standard posture is considered ideal if the vertebrae and ribs are regularly aligned and form normal angles in the lower extremity of the back. Bad posture can cause physical imbalance, which causes overwork of muscles, joints and the other parts\(^5\). Generally, posture analysis is performed in three planes\(^5\):

a. Lateral Posture Analysis: head (neck), shoulder, vertebra, hips, knees and feet
b. Anterior Posture Analysis: head (neck), shoulder, chest, abdomen, waist, elbow, hips, knees and feet
c. Posterior Posture Analysis: head (neck), shoulder, vertebra, hips and knee.

Other commonly used posture analysis methods are listed below:

a. New York State Posture Evaluation\(^8,9\),
b. Radiographic Test\(^10\),
c. Laser-Posture Device\(^11\),
d. Photogrammetry\(^12\),
e. Computer Based Posture Analysis (a digital software measurement program and video analysis)\(^13–16\).

Posture analyses can be executed visually rather than radiographically. Radiographic evaluation is undesirable because of its cost, time and exposure to X-rays. Visual evaluation offers advantages of low cost, time saving and a wide range of applications\(^6\). The outcomes of visual evaluation are defined qualitatively (as good, medium and bad levels), with deviations from plumb alignment described as slight, moderate, or marked rather than in terms of inches or degrees\(^5\). A disadvantage of visual posture analysis is that these descriptors are frequently misunderstood by some sports scientists because they are not described in concrete (real) terms. Another disadvantage is its low confidence level. Anthropometric and radiographic measurement processes are also time-consuming. Thus, if a posture analysis method produces quantitative data with a high confidence level, it could be easily applied to determine the physical characteristics of athletes\(^7\).

Proper dribbling practices during the basic basketball training of children are important with regard to their physical, physiological, biomotor, and technical features and development.

In this study, we investigated of the effects of intensive one-sided and double-sided training drills on the postures of basketball playing children 

**MATERIALS AND METHODS**

**Subjects**

Forty male basketball players registered for a summer basketball training course held in Isparta (Turkey) voluntarily participated in the study. The subjects had just begun to play basketball. The players were randomly assigned to two equally sized groups: the one-sided dribbling group (SDG, age 11.1 ± 0.65 years old, height 1.43 ± 0.68 m body weight 35.26 ± 5.25 kg), and the double-sided dribbling group (DDG, age 11.7 ± 0.81 years old, height 1.45 ± 0.26 m, body weight 37.1 ± 3.60 kg).

Visual assessment data were recorded using a digital camera (Olympus, Camedia c-725, 3 MP, 8 optical zoom). The digital camera was fixed on a tripod at a height of 90 cm and at a distance of 150 cm from the subject. Postural images were taken at 10.00 AM in the morning, which is accepted as the time when the body is most rested.

**Methods**

The visual posture analysis evaluations were performed with “Posture Analysis” software. This software supported the researchers by converting the images into electronic files and minimizing visual errors topographically. It shortened the postural evaluation time and made this evaluation method reliable and easy to perform. Each photograph was analyzed twice by the program to check test-retest reliability. We found no significant differences between the readings on different dates (p>0.05).

“Posture Analysis” was originally developed by Kilinc\(^15\). Following a process of testing and calibration\(^9,15\), the program achieved a satisfactory level of validity and reliability for it to be used in taking research measurements. When the New-York Posture Analysis program, which is the generally accepted method in Turkey was compared to “Posture Analysis”, no significant differences were found between the two assessment methods (p>0.05).
a. Anterior Analysis:

A reference line divides the participant vertically into two parts. Fixed points are determined on that reference line following established practice and marked on the participant’s photo.

The first marker was placed on the glabella, midway between the eyebrows. The edges of the two eyes were marked and their angles with the first marker were determined.

The second marker was placed on the middle upper side of manubrium sterna, incisura jugularis. The left and right edges of the acromion were marked and the angles were determined.

The third marker was placed in the middle of manubrium sterna, on the intermamillar point. The left and right nipples were marked and the angles were determined.

The fourth marker was placed right over the umbilicus. The edges of the left and right iliac crests were marked and the angles were determined.

The fifth marker, the valgus angle, was determined by putting a mark in the middle of the right knee.

These angles were computed for each side of the body, and the participant’s body symmetry was studied according to differences between left and right angles.

b. Lateral Analysis:

The first marker was placed on the middle of the cervical curvature of the neck. The cervical angle

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Fig. 1. Lateral and Anterior Posture Analysis in the “Posture Analysis” Software.
was calculated by marking the cervical upper point (upper angle, $a_1$) and lower point (lower angle, $b_1$) with respect to the first marker, according to the following formula:

$$\text{Cervical Angle} = [a_1 (\text{cervical upper point}) + b_1 (\text{cervical lower point})] - 180$$

The second marker was placed on the outmost point of the dorsal region. The dorsal angle was calculated by marking the upper hand of the first thorax vertebra ($a_2$) and the inferior of the thorax ($b_2$) with respect to the second marker, according to the following formula:

$$\text{Dorsal Angle} = [a_2 (\text{dorsal upper point}) + b_2 (\text{dorsal lower point})] - 180$$

The third marker was placed on the middle of the innermost point of the lumbar region concavity. The lumbar angle was calculated by marking the upper hand of the lumbar region [$lumbar upper angle (a_3)$] and the lower hand of the lumbar region [$lumbar lower angle (b_3)$] with respect to the third marker, according to the following formula:

$$\text{Lumbar Angle} = [a_3 (\text{lumbar upper point}) + b_3 (\text{lumbar lower point})] - 180$$

The fourth marker was placed in the middle of the popliteal area. The popliteal angle was calculated by marking the middle point of the hamstring [upper angle ($a_4$)] and the middle of the m. triceps surae [lower angle ($b_4$)] with respect to the fourth marker, according to the following formula:

$$\text{Popliteal Angle} = \frac{[a_4 (\text{midpoint of m. hamstrings}) + b_4 (\text{midpoint of m. triceps surae})]}{2}$$

From the angle data, the descriptive statistics were derived. T-tests for independent means were then calculated to determine the statistical significance of any differences between the two groups. The level of significance was set at alpha < 0.05.

The training program in Table 1 consisted of two periods of 2.5 months. Both groups were subject to training for 1.5 hours daily during a period of 10 weeks. This included 47 training days (47 training sessions) and 20 rest days, to give a total of 73.5 training hours. Medical examinations were provided before both pretest and posttest. Table 1 shows mean values of loading intensity. For example, the mean loading intensity of the fourth week of the first period was 70%. (60% on days I and II, 75% on day III and 85% on day IV). Intensity of weekday was increased in the same way. Table 1 shows that at the part of loading intensity of days, pretest and posttest was performed on the 3rd and 67th days.

Both the one-sided and double-sided dribbling groups performed the same set of drills. However, the one-sided dribbling group performed the drills using their dominant side only, while double-sided dribbling group was trained using both sides (dominant and nondominant) the same amount.

RESULTS

The participants of this study initially presented similar physical characteristics ($p>0.05$). Before the training period, no significant differences were found in any of the anterior and lateral posture pretest values of the two groups ($p>0.05$).

When the posttest anterior posture values of one-sided dribbling and double-sided dribbling children were compared, no significant variations were found for the head, pelvis and valgus angle values ($p>0.05$). On the other hand, subjects revealed a significant difference in their shoulder and chest asymmetry ($p<0.05$).

When the posttest lateral posture values of one-sided dribbling and double-sided dribbling children were compared, no significant variations were determined between the cervical, lumbar, and popliteal algus angle values ($p>0.05$) but significant differences were found with respect to dorsal region degrees ($p<0.05$).

DISCUSSION

The observation that one-sided dribbling basketball players exhibited shoulder drop on their dominant side seems to warrant further intervention in training programs to prevent muscular imbalance and possible physical problems.

We are of the opinion that shoulder drop on a basketball player’s dominant side may happen because of using the dominant side effectively (shooting, rebounds, dribbling, lay-ups) in actual match play, together with performing one-sided drills during basic technical training. A previous study by Karakus and Kilinc also suggested that shoulder drop occurred on players’ dominant sides, and that this might stem from the one-sided training these players carried out. Karakus and Kilinc observed in their study that postural differences existed between basketball players and control subjects, and that basketball players exhibited kyphos-lordosis. Further evidence can be found
from other sports where, for example, Greenfield et al.\textsuperscript{10} found shoulder asymmetries in one wrestler, two handball players, and three track and field athletes who had shoulder injuries. Kyphotic athletes, who have strong and well-developed but shortened pectoral muscles, are found frequently among gymnasts, weightlifters and football players as well as basketball players. All are susceptible to anterior dislocations of the arm, particularly when the arm is forced into an abducted and extended position accompanied by outward rotation\textsuperscript{20}.

In accordance with the data of our present study, in basketball, rather than one-sided dribbling exercises, double-sided dribbling ones are recommended, because this can be said to be more beneficial for the posture of the children.

**ACKNOWLEDGEMENT**

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**REFERENCES**


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### Table 1. Pretest-postest anterior posture comparison of one-sided dribbling and double sided dribbling children

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>Cervical Asymmetry (Degree)</th>
<th>Shoulder Asymmetry (Degree)</th>
<th>Chest Asymmetry (Degree)</th>
<th>Pelvis Asymmetry (Degree)</th>
<th>Valgus Angle (Degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRETEST</td>
<td>Single Dribbling n.20</td>
<td>.88 ± 0.3</td>
<td>.90 ± 0.3</td>
<td>.97 ± 0.2</td>
<td>1.01 ± 0.1</td>
<td>176.1 ± 0.4</td>
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<td></td>
<td>Double Dribbling n.20</td>
<td>.96 ± 0.4</td>
<td>.97 ± 0.3</td>
<td>.95 ± 0.3</td>
<td>1.08 ± 0.1</td>
<td>176.4 ± 0.5</td>
</tr>
<tr>
<td>POSTTEST</td>
<td>Single Dribbling n.20</td>
<td>0.88 ± 0.2</td>
<td>1.49 ± 0.3*</td>
<td>1.33 ± 0.3*</td>
<td>1.17 ± 0.1</td>
<td>176.1 ± 0.4</td>
</tr>
<tr>
<td></td>
<td>Double Dribbling n.20</td>
<td>0.96 ± 0.4</td>
<td>0.96 ± 0.2</td>
<td>0.95 ± 0.3</td>
<td>1.11 ± 0.1</td>
<td>176.4 ± 0.5</td>
</tr>
</tbody>
</table>

*p<0.05.

### Table 2. Pretest-postest lateral posture comparison of one-sided dribbling and double-sided dribbling children

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>Cervical Angle (Degrees)</th>
<th>Dorsal Angle (Degrees)</th>
<th>Lumbal Angle (Degrees)</th>
<th>Popliteal Angle (Degrees)</th>
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</thead>
<tbody>
<tr>
<td>PRETEST</td>
<td>Single Dribbling n.20</td>
<td>116.9 ± 1.9</td>
<td>152.1 ± 2.9</td>
<td>138.7 ± 1.7</td>
<td>171.5 ± 0.7</td>
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<td>Double Dribbling n.20</td>
<td>116.5 ± 3.7</td>
<td>153.2 ± 3.9</td>
<td>139.0 ± 2.9</td>
<td>171.1 ± 0.8</td>
</tr>
<tr>
<td>POSTTEST</td>
<td>Single Dribbling n.20</td>
<td>116.5 ± 2.1</td>
<td>154.9 ± 4.4*</td>
<td>138.9 ± 2.2</td>
<td>171.5 ± .7</td>
</tr>
<tr>
<td></td>
<td>Double Dribbling n.20</td>
<td>116.4 ± 2.9</td>
<td>154.2 ± 4.9</td>
<td>138.7 ± 2.8</td>
<td>171.1 ± .8</td>
</tr>
</tbody>
</table>

*p<0.05.


