Training Repeated Effort Ability in National Team Male Volleyball Players

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Purpose: This case study evaluated the effect of repeated lateral movement and jumping training on repeated effort ability in a group of national team male volleyball players. Methods: Twelve volleyball players were assessed on their volleyball-specific repeated movement and jumping abilities using a volleyball-specific repeated effort test (RET) before and after 12 weeks of training. The athletes performed between 8 and 9 volleyball training sessions per week, with 5 to 6 of these sessions including specific training aimed at improving repeated effort ability. Typically these training sessions involved 8 to 12 repetitions of 2 to 3 block jumps over a 9-m lateral distance (ie, the athletes had to perform jumps and lateral movements, typical of front court play in volleyball). Population-specific repeatability data were used to determine whether any changes that may have occurred in this study were beyond the minimal clinically important difference (MCID) for this testing procedure. Results: Improvements in all variables of the RET were observed for each athlete involved in the study, with a small-to-moderate magnitude observed for the mean changes in each variable (Cohen’s $d$, 0.21 to 0.59). All of the improvements in the results exceeded the MCID. Conclusions: These findings demonstrate that the RET is sensitive to training-induced changes. Lateral movement speed and repeated lateral movement speed, as well as jumping and repeated jumping ability are trainable qualities in high-performance volleyball players.

Keywords: jumping, speed, block, spike, sprint

Volleyball is an intermittent court sport, with multiple jumps and lateral movements performed throughout a match.1–3 Our previous investigations have highlighted the importance of jumping ability and lateral movement speed, and the ability to perform these tasks repeatedly, as an important performance measure.4 However, no investigations have examined the trainability of jumping and movement speed (or repeated jumping and movement) specific to volleyball. Therefore, the purpose of this investigation was to evaluate the trainability of jumping ability and movement speed, as well as these repeated efforts, using our previously developed volleyball repeated effort test (RET). In turn, this...
investigation also provided an evaluation of the sensitivity of this test to detect training-induced changes.

**Methods**

Twelve national team volleyball players (18.7 ± 2.2 years, 202.0 ± 5.0 cm, 90.5 ± 5.8 kg) were assessed on their volleyball-specific repeated movement and jumping abilities using the RET before and after 12 weeks of training. The RET has been described in detail previously.\(^4\) However, in brief, this test involves four repetitions of jumping and movement tasks, beginning every 20 s. The total duration of a repetition generally varies between 12 and 17 s. During each repetition, the athlete must perform two measured spike jumps, and timed lateral movement at the net in both directions, interspersed by four separate block jump movements to touch a fixed position 15 cm above and over the net. This allows for a determination of each athlete’s best spike jump and lateral movement speed, as well as their average spike jump and movement speed. As the average jump height and movement speeds include all measurements from all 4 repetitions, this measure is believed to reflect resistance to fatigue in repeated jumping and movement.

The athletes performed between eight and nine volleyball training sessions per week for 12 weeks (102 sessions, total), with five to six of these sessions each week including specific training aimed at improving repeated effort ability (66 sessions, total). Typically, this involved 8 to 12 repetitions of two to three block jumps over a 9-m lateral distance (ie, the athletes had to perform jumps and lateral movements, typical of front court play in volleyball). The segment of the practice targeted toward these activities was typically 10 minutes in duration, representing approximately 5% of total on-court training time for the 12-week period. Population-specific reliability data were used to determine whether any changes that may have occurred in this study were beyond the minimal clinically important difference (MCID) for this testing procedure.\(^5,6\)

**Results**

Table 1 outlines the changes observed in the variables involved in the RET. All athletes improved on each of the variables involved in the test, with a small-to-moderate magnitude observed for the mean changes in each variable (Cohen’s \(d\), 0.21 to 0.59). All of the improvements in the results exceeded the MCID.

**Discussion**

The purpose of this investigation was to evaluate the trainability of jumping ability and movement speed, as well as the ability to perform these tasks repeatedly, using our previously developed volleyball repeated effort test (RET). In turn, this investigation also provided an evaluation of the sensitivity of this test to detect training induced changes. The results of this study suggest that jumping ability and movement speed, as well as the ability to perform these tasks repeatedly, are moderately trainable in national team volleyball players when specific training is
Table 1  Repeated Effort Ability Before and After 12 Weeks of Targeted Training; Change Score, Technical Error (TE), Minimal Clinically Important Difference (MCID), and Cohen’s Effect Size (d) in National Team Volleyball Players (Data Are Mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Pretraining</th>
<th>Posttraining</th>
<th>Change</th>
<th>MCID</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Jump (cm)</td>
<td>328.0 ± 9.1</td>
<td>333.7 ± 10.3</td>
<td>5.7</td>
<td>1.88</td>
<td>0.59</td>
</tr>
<tr>
<td>Average Jump (cm)</td>
<td>324.1 ± 9.9</td>
<td>328.5 ± 9.5</td>
<td>4.4</td>
<td>1.88</td>
<td>0.45</td>
</tr>
<tr>
<td>First Time (s)</td>
<td>7.4 ± 0.8</td>
<td>7.2 ± 0.7</td>
<td>0.2</td>
<td>0.10</td>
<td>0.27</td>
</tr>
<tr>
<td>Average Time (s)</td>
<td>7.8 ± 1.0</td>
<td>7.6 ± 0.9</td>
<td>0.2</td>
<td>0.10</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Sheppard, Gabbett, and Borgeaud implemented for a 12-week training period. The results also suggest that greater gains can be observed in jumping and repeated jumping ability in comparison with movement speed.

In addition, the RET appears to be sensitive to training-induced changes. Although we have previously reported methodological data on the RET, including reliability and discriminate validity statistics, the results of the current study further support the utility of the RET methodology. Collectively, these results suggest that for high-performance volleyball players, the RET is a reliable, valid, and sensitive method of assessing volleyball-specific repeated jumping and movement speed qualities.

**Practical Applications**

No control group was used for this study, and as such, the precise extent to which the training intervention accounted for the change in performance on the RET cannot be established. However, the results of this study suggest that repeated jumping and movement speed are trainable qualities in high-performance volleyball players.

**References**