Effect of an exercises program with Swiss ball on selected co-ordinative abilities in inter university basketball players

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Abstract. Aim. The purpose of the study was to determine the effect of an exercises program with Swiss ball on selected co-ordinative abilities in inter university basketball players. Materials and Methods. The researcher utilized the experimental method on a sample of (24) male basketball players (mean±SD): age=21.54±1.57 years, height=1.782±0.053 m, body mass= 66.205±5.41kg) The study was approved by the Ethics Committee of Directorate of Sport in Guru Nanak Dev University, Amritsar, India. All participants were informed about the study aim and methodology as well as about the possibility of immediate acceptance at any time of the experimentation. Subjects agreed to the above conditions in writing. They were randomly assigned into two groups: A (Training Group) and B (Control Group), n=12 each. The subjects from training group were subjected to 5 weeks of Swiss ball exercises program. This lasted 5 weeks and consisted of daily sessions, lasting 45 min each. Results and conclusion. The coordinative abilities significantly improved in training group as compared with the control one. The Swiss ball exercises program may be recommended to improve coordinative abilities and may contribute to enhance concentration based performance.

Key words: Swiss ball, co-ordinative abilities, basketball players.

Introduction
Co-ordinative abilities are primarily dependant on the motor control and regulation processes of CNS. The theory of motor co-ordination therefore is the basis for understanding the nature of co-ordinative abilities. For each co-ordinative ability the motor control and regulation processes function in a definite manner. In coordinative abilities this processes are just stabilized and perfected for execution of a wide number of movements similar to each other. The sufficient training of coordinative abilities limits the performance ability especially at higher levels.

On the contrary, better developed coordinative abilities provide on essential base for faster and the effective learning, stabilization and the variation in technique and their successful execution in game situation.

The quality of performance of all fundamental, mechanical skills, the rhythm, accuracy, amplitude etc. is affected by coordinative abilities. It helps in developing very fine extra incredible skills. The use of physioballs/Swiss balls in strength and conditioning programs has become ubiquitous. Swiss balls have been incorporated into strength training regimes and touted as a means to more effectively train the musculoskeletal system. Performing strength exercises on Swiss balls has been advocated on the belief that a labile surface will provide a greater challenge to the trunk musculature; increase the dynamic balance of the user. Swiss balls are currently used to replace stable benches during the performance of upper body strength training exercises.

While previous work has documented the myoelectric activity of the trunk muscles during exercises specifically designed to train the trunk muscles, no study has documented the effect of an unstable surface on trunk muscle activity during resistance exercises for the upper limbs (1).
However, there is little scientific evidence to support its use (2, 3). It is also not clear whether performing an exercise on a Swiss ball has greater benefit than performing the same exercise on a stable surface.

The use of Swiss ball training for core muscle development has been popular for several years (4). Multiple studies have examined core muscle recruitment during varying types of Swiss ball abdominal exercises (5, 6) and during traditional abdominal exercises like the crunch (abdominal curl-up) and bent-knee sit-up (7, 8).

Most researchers who studied the use of Swiss ball exercises quantified abdominal muscle activity during the crunch, push-up, and bench press exercises, and typically investigated the recruitment patterns of only 1 or 2 muscles (9-12). Numerous other Swiss ball exercises are used in training and rehabilitation to enhance core development and stability.

Due to common use of Swiss balls this lack of research is significant for both performance and safety concerns (i.e. Swiss balls may increase the risk of falling without providing an exercise benefit).

Stability is achieved through the co activation of trunk muscles; therefore, endurance training has been postulated to be beneficial in training trunk muscles to provide stability. It is possible that performing upper body strength exercises on a Swiss ball can increase trunk muscle activity to a sufficient extent to adequately stress the spinal stabilizing musculature to achieve beneficial endurance training effects.

The purpose of this investigation is to determine the effect of an exercises program with Swiss ball on selected co-ordinative abilities in inter university basketball players.

**Material and Method**

The researcher utilized the experimental method on a sample of (24) basketball boys (mean±SD) (table I): age=21.54±1.57years, height = 1.782±0.053m, body mass=66.205±5.41kg). This study was approved by the Ethics Committee of Directorate of Sport in Guru Nanak Dev University, Amritsar, India.

All participants were informed about the study aim and methodology as well as about the possibility of immediate acceptance at any time of the experimentation. Subjects agreed to the above conditions in writing.

They were randomly assigned into two groups: A (Training Group) and B (Control Group), n=12 each. The subjects were subjected into 5 week Swiss ball training programme.

The subjects from training group underwent exercises program with Swiss ball (figure 1-4) - pelvic tilt (side-to-side); abdominal crunch; supine bridge and roll (in-and-out); squat - for 5 weeks of daily sessions, lasting 45 min each.

Orientation ability, reaction ability, balance ability and rhythm ability measurements: orientation ability was measured by numbered medicine ball run and was recorded in seconds; reaction ability was measured by ball reaction exercise test and was measured in meter and centimeter; balance ability was assessed by long nose test and was measured in seconds; rhythm ability was assessed by sprint at given rhythm test. The orientation, balance ability, reaction ability and rhythm ability were recorded to the nearest 1/10th of a second.

**Statistical Analysis.** SPSS statistical software (version 16.0) was used to analyze. Student’s t-test for independent data was used to assess the between-group differences and for dependent data to assess the Post-Pre differences. The level of p≤0.05 was considered significant.

<table>
<thead>
<tr>
<th>Table I. Subjects’ demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
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<tr>
<td>Body mass (kg)</td>
</tr>
<tr>
<td>Body height (m)</td>
</tr>
</tbody>
</table>

N: sample size, SD: standard deviation, m: meters, kg: kilograms
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Figure 1. Pelvic tilt (side-to-side)
Starting Position: Sitting with feet flat on the floor, buttocks lightly pressed into the Ball. Action: Tilt pelvis to the left and right, keep head and shoulders steady. Contract abdominal muscles so that the trunk remains erect.

Figure 2. Abdominal crunch
Starting Position: supine, Ball resting above the buttocks, feet flat on the floor, arms folded over chest.
Action: contract abdominal muscles and curl trunk forward.

Figure 3. Supine bridge and roll (in-and-out)
Starting position: on the back (bridge position), bodyweight balanced on shoulders and heels.
Action: contract lower abdominal muscles to roll ball toward body; finish with feet flat on the ball.

Figure 4. Squat
Starting Position: feet hip-width apart and flat on the floor (slightly forward of the body), back straight and head up, arms forward. Ball rests lightly between the back (above hips) and wall surface. Action: bend at the hip and knee to lower the trunk so that the thighs are at 90 degrees (hold), return to start position keeping bodyweight centered over the heels. Increase difficulty by changing arm position or holding a weight in the hands.

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Results
Table II shows that the mean of orientation ability of pre-test and post-test of Training Group was 9.57 and 8.77 respectively, whereas the mean of pre-test and post-test of Control Group was 10.07 and 10.77. The t value in case of training was 3.82 and for Control Group it was 1.29. The critical value of t at 95% probability level in Training Group is much lower (1.761) than the observed value of t (3.82*).

The data does suggest that the differences between pre-test and post-test of orientation ability in Training Group are significant. The mean of reaction ability of pre-test and post-test of Training Group was 1.51 and 1.37 respectively, whereas the mean of pre-test and post-test of Control Group was 1.88 and 2.13. The t value in case of Training Group was 2.39 and for control group it was 1.35. The critical value of t at 95% probability level in Training Group is much lower (1.761) than the observed value of t (2.39*).

The data does suggest that the differences between pre-test and post-test of reaction ability in Training Group are significant.

Whereas the mean of balance ability of pre-test and post-test of Training Group was 5.62 and 6.13 respectively, whereas the mean of pre-test and post-test of Control Group was 6.12 and 6.55. The t value in case of training was 2.01 and for control group it was 1.15. The critical value of t at 95% probability level in Training Group is much lower (1.761) than the observed value of t (2.01*).

The data does suggest that the differences between pre-test and post-test of balance ability in Training Group are significant.

The mean of rhythm ability of pre-test and post-test of Training Group was 0.41 and 0.83 respectively, whereas the mean of pre-test and post-test of Control Group was 0.41 and 0.49. The t value in case of training was 2.36 and for control group it was 0.78. The critical value of t at 95% probability level in Training Group is much lower (1.761) than the observed value of t (2.36*).

The data does suggest that the differences between pre-test and post-test of rhythm ability in Training Group are significant.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>VARIABLE</th>
<th>PRE-TEST</th>
<th>POST-TEST</th>
<th>T-VALUE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>Orientation ability</td>
<td>9.57±0.68</td>
<td>8.77±0.37</td>
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<td>Control</td>
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<td>Reaction ability</td>
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<td>1.37±0.14</td>
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<tr>
<td>Control</td>
<td>Reaction ability</td>
<td>1.88±0.47</td>
<td>2.13±0.56</td>
<td>1.35</td>
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<tr>
<td>Training</td>
<td>Balance ability</td>
<td>5.62±0.71</td>
<td>6.13±0.60</td>
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<tr>
<td>Control</td>
<td>Balance ability</td>
<td>6.12±0.80</td>
<td>6.55±0.93</td>
<td>1.15</td>
<td>0.2738</td>
</tr>
<tr>
<td>Training</td>
<td>Rhythm ability</td>
<td>0.41±0.23</td>
<td>0.83±0.65</td>
<td>2.36*</td>
<td>0.0377</td>
</tr>
<tr>
<td>Control</td>
<td>Rhythm ability</td>
<td>0.41±0.23</td>
<td>0.49±0.30</td>
<td>0.78</td>
<td>0.4508</td>
</tr>
</tbody>
</table>

Table II. Mean values (mean±SD) orientation ability, reaction ability, balance ability and rhythm ability training and control groups (n = 12s each) before (pre) and after (post) 5 weeks of training

Discussion
The primary finding of this investigation was reveals that regular participation in a progressive Swiss ball training program produced greater magnitude of improvement in orientation ability, reaction ability and balance ability of university level basketball players. The present observations suggest that six weeks of exercises program with Swiss ball resulted in significant improvement in orientation ability, reaction ability and balance ability in training group as compared to the control one. These finding substantiate the assertion that the several studies have shown that comprehensive preventive program with inclusion of Swiss ball exercises to improve strength and balance for geriatric population is beneficial for improving their functional wellbeing (13). With the exception of one study conducted by Reichley and McQueen state the occurrence of improved balance with the use of the stability ball. Reichley found that patients’ range of motion and strength improved through the use of the stability ball program (14, 15, and 16). The progressive PhysioBall core strength program included 6 exercises each with 3 levels of continuing difficulty, which was conducted 4 times a week for 7 weeks. They showed that an enhancement in performance and reaction ability of the subjects, but there was no significant difference versus the control group (17). Future studies may also determine contradicted results of the study.
indicated that Swiss ball training has significant effect on core muscle strength. For dynamic balance, at the end of the 10-week Swiss ball training, in both groups (Swiss ball and control), dynamic balance scores were improved significantly. Therefore, effect of the Swiss ball training on dynamic balance could not be determined (18).

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