ABSTRACT

The research aimed to design an exercises program with Swiss ball and recognize its effect on static and dynamic balance in inter university basketball players. The researcher utilized the experimental method on a sample of (24) female basketball players (mean ± SD: age 21.79 ± 1.72 years, height 1.64 ± 0.034 m, body mass 61.208 ± 3.476 kg). 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 training group were subjected to 6-weeks of swiss ball exercises program. This training program lasted 6-weeks and consisted of daily sessions, lasting 45 min each. The subjects completed the stork stand and wobble board tests to determine static and dynamic balance on the leg respectively. The training group significantly improved static and dynamic balance compared to the control. The swiss ball exercises program may be recommended to improve static and dynamic balance and may contribute to enhance concentration based performance.

KEY WORDS: Swiss Ball; Static Balance; Dynamic Balance; Basketball Players.
INTRODUCTION

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 (14). However, there is little scientific evidence to support its use (18, 21). 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 (2). Multiple studies have examined core muscle recruitment during varying types of Swiss ball abdominal exercises (15, 19, and 22) and during traditional abdominal exercises like the crunch (abdominal curl-up) and bent-knee sit-up (4, 5). 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. (1, 6, 11, 16,) 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 (7). 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 static and dynamic balance in inter university basketball players.

MATERIAL AND METHODS

Twenty four (24) female basketball players (mean ± SD: age 21.79 ± 1.72 years, height 1.64 ± 0.034 m, body mass 61.208 ± 3.476 kg) of Guru Nanak
Dev University, Amritsar who participated in inter-university basketball championship held at Dr. Y.S. Parmar Agriculture University, Nauni, Distt. Solan, volunteered to participate, after being informed of the procedures of the study, before signing an inform consent form. Subjects agreed to the above conditions in writing. This study was approved by the Ethics Committee of Directorate of Sport in Guru Nanak Dev University, Amritsar, India. They were randomly assigned into two groups: A (Training Group) and B (Control Group), n = 12 each.

Table 1. Subjects’ Demographics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group</th>
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<tbody>
<tr>
<td></td>
<td>Training Group</td>
</tr>
<tr>
<td></td>
<td>(N = 12)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>21.79 ± 1.72</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>61.5 ± 2.84</td>
</tr>
<tr>
<td>Body height (m)</td>
<td>1.64 ± 0.046</td>
</tr>
</tbody>
</table>

N: sample size, SD: standard deviation, m: meters, kg: kilograms.

PROCEDURE AND MEASUREMENTS

The study was approved by the Ethics Committee of Directorate of Sport in Guru Nanak Dev University, Amritsar, India. The training group underwent a specially designed program with Swiss ball containing pelvic tilt (side-to-side); abdominal crunches; supine bridge and roll (in-and-out); squats for 6-weeks of daily sessions, lasting 45 min each.

Exercise Prescription

**Back extension:** The subjects prone over the Ball with arms folded over chest, legs spread for balance. Action lift the trunk and keep the elbows pulled back slightly (hold), body should be in a straight line. (Add difficulty by holding the arms out to the side with elbows bent – pull shoulders back).
Hamstring Stretch: The subjects are own supine position with heels resting on Ball. Starting Position side resting on Ball Action lift one leg and hold in vertical position with legs spread apart for balance. (Using hands), then alternate exercise with other leg.

Quadriceps Stretch: The subjects are standing with one foot resting on Ball, back straight. Action lower bodyweight (hold), return to start.
**Pectoral Stretch**: The subjects are kneeling with one hand on the Ball and one hand on the floor for balance. Action lower bodyweight (alternate left and right).

![Pectoral Stretch](image1)

**Figure 4**: *Pectoral Stretch.*

**Groin Stretch**: The subjects are supine position with legs extended and heels resting on the Ball. Bring one leg across the other knee. Actions roll Ball toward the body so that the 'contact leg' finishes at 90 degree angle (alternate left than right legs).

![Groin Stretch](image2)

**Figure 5**: *Groin Stretch.*

**STATIC BALANCE MEASUREMENT**

The subjects completed the test on the dominant and non-dominant foot. The subjects kept their hands on their hips with the uninvolved foot against the medial side of the knee of the stance leg. Each subject maintained this position while standing on the ball of the foot for the maximum possible time. The trial ended when the heel of the involved leg touched the floor, the hands
came off of the hips, or the opposite foot was removed from the stance leg. The best of three trials was recorded for analysis.

**DYNAMIC BALANCE MEASUREMENT**

The subjects performed the wobble board test in a unilateral stance on their dominant and non-dominant foot. With the shoes off, the subjects stood on the center of the wobble board and the uninvolved foot free to move in space. During a 15 second period, each subject attempted to maintain balance without allowing the board to touch the contact plate that was positioned on the floor 2 inches under the wobble board. The subjects were instructed to regain their balance as quickly as possible when the wobble board touched the contact plate. Within the 15 second period, the duration the wobble board touched the contact plate (time off balance) was recorded for analysis. The least duration of time off balance during the 15 second period after 3 trials was analysed.

![Figure 6: Static and Dynamic Balance.](image)

**STATISTICAL ANALYSIS**

SPSS statistical software (version 16.0) was used to analyze. Both descriptive (mean and standard deviation) and inferential statistical were used to analyse the data. A Paired (samples) t-test was computed to test for any significant difference in the static and dynamic balance in inters university basketball players.
RESULTS

The results of exercises program with swiss ball on static and dynamic balance of the training and control groups are presented in the following tables:

Table - 3 shows that the mean of static balance of pretest of training group and posttest of training group was 20.00 ± 1.80 and 22.75 ± 1.54 respectively, whereas the mean of static balance of pre test of control group and post test of control group was 18.66 ± 1.77 and 18.75 ± 1.65. The t value in case of training group was 4.75 and for control group it was 0.158. The critical value of t at 95% probability level in training group is much lower (1.79) than the observed value of t (4.75). The data does suggest that the differences between pre-test and post test of static balance in training group are significant. The graphical representation of responses has been exhibited in figure - 7.

Table - 4 shows that the mean of dynamic balance of pretest of training group and posttest of training group was 18.91 ± 1.67 and 21.00 ± 0.95 respectively, whereas the mean of static balance of pre test of control and post test of control group was 17.58 ± 0.79 and 18.16 ± 1.46. The t value in case of training group was 3.74 and for control group it was 1.46. The critical value of t at 95% probability level in training group is much lower (1.79) than the observed value of t (3.74). The data does suggest that the differences between pre - test and post test of dynamic balance in training group are significant. The graphical representation of responses has been exhibited in figure - 8.

Table 2. *Mean Values (± SD) of static and dynamic balance in the training group (N = 12) before (Pre) and after (Post) of 6-weeks of exercises program with Swiss ball*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Training Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre - Test</td>
<td>Post - Test</td>
</tr>
<tr>
<td>Static Balance</td>
<td>20.00 ± 1.80</td>
<td>22.75 ± 1.54</td>
</tr>
<tr>
<td>Dynamic Balance</td>
<td>18.91 ± 1.67</td>
<td>21.00 ± 0.95</td>
</tr>
</tbody>
</table>

*t* value in the table at significant level of 0.05 = 1.79.
Figure 7: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Static Balance of Training and Control Group.

Figure 8: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Dynamic Balance of Training and Control Group.
DISCUSSION AND CONCLUSION

The result of the present study annotations showed that six-weeks of exercises program with swiss ball resulted in significant improvement in static and dynamic balance in training group as compared to the control one. These finding substantiate the assertion that the several studies have shown that strength training improves balance. (Heitkamp et al. 2001) (v. Pichalopoulou et al. 2004), (Pintsaar et al. 1996) while other studies have reported that balance training improves strength. (Heitkamp et al. 2002) In contrast to these results reported no change in balance performance after resistance training. Wolfson et al. (1993) (Verfaillie et al. 1997) With the exception of one study of experienced judokas. (Heitkamp et al. 2002) untrained, sedentary, and elderly subjects with low initial levels of strength participated in these investigations. It is possible that a significant relationship exists between strength and balance in subjects who demonstrate muscle weakness, and as a minimum threshold of strength is attained, the relationship between strength and balance may be attenuated. Similar to the findings of a number of wobble board (Emery et al. 2005) and sensor motor (Bruhn et al. 2001, 2004), (Heitkamp et al. 2001) training studies there were improvements in static balance following fixed foot balance training. Following the concept of training specificity (Sale, 1988) there were no crossover effects of functionally directed balance training on static balance measures. However, a more complete evaluation of training specific and crossover effects of the balance training programs should have included a wider array of static and dynamic balance tests.

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REFERENCES


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