Effect of Suryanamaskar on flexibility of school girls

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Abstract
The objectives of the study were to determine the effect of Suryanamaskar on flexibility and to compare effect of different pace of Suryanamaskar on flexibility. Pretest-posttest group design was used for this study. Three groups were created, two experimental group and one control group. 15 girls were in each group in the age range of 16 – 18 years, out of 45 girls only 30 girls were able to complete total six weeks practices. First experimental group performed Suryanamaskar with 2 minutes pace, second experimental group performed with 4 minute pace and third served as a control group. Total treatment duration was six weeks. Flexibility was measured by sit and reach test before (pretest) and after (postest) the treatment pried of all three groups. To determine the effect of Suryanamaskar on flexibility of school girls analysis of covariance was used and level of significance was set at 0.05. In relation of flexibility, a significant improvement (P < 0.05) was found in both pace 2 and pace 4 at the end of six weeks of practice.

Keywords: Suryanamaskar, Pace and flexibility

1. Introduction
Flexibility is the ability to move the body joints through a maximum range of motion without strain. Flexibility is an important component of health related fitness and the lacks of flexibility create functional problems or disorders for many individual. Lack of flexibility in the back can be responsible for bad posture, compression of peripheral nerves, back pain and many more and if an individual with good flexibility have great ease movements, less chance of injury during movements. (miller, 2006) [7].

The Sanskrit name surya here refers to the sun and namaskara means 'salutations'. Surya namaskara has been handed down from the enlightened sages of the vedic age. The sun symbolizes spiritual consciousness and in ancient times was worshipped on a daily basis. In yoga the sun is represented by pingala or surya nadi, the pranic channel which carries the vital, life giving force. This dynamic group of asanas is not a traditional part of hatha yoga practices as it was added to the original asana group at a later time. However, it is an effective way of loosening up, stretching, massaging and toning all the joints, muscles and internal organs of the body. (Saraswati, 2002) [5].

Practice of asanas is one of the best ways to improve flexibility. There are plenty of studies have been done to see the effect of yogic asanas on flexibility, and Suryanamaskar is itself combination of six asanas. Going through many research papers this query has been raised that will change in the pace of Suryanamaskar effect on the flexibility of joints. (Bhavanani, 2011) [9].

The objectives of the study were to determine the effect of suryanamaskar flexibility and to compare effect of different paces of suryanamaskar on flexibility.

2. Method
Subjects: The subjects for this study were selected from the KIDDY’S CORNER SCHOOL, Gwalior. Forty five girls in the age range of 16 – 18 years from class 11th and 12th were selected randomly for this study.
Variables: Suryanamaskar was considered as independent variable and flexibility was considered as dependent variable.
Test for flexibility: Flexibility of lower back and leg muscles was measured by Sit and Reach test. The subject was asked to remove shoes and place her feet against the testing box while sitting on the floor with straight knees. Then the subject was asked to place one hand on top of
the other hand so that the middle fingers of both hands were together at the same length. The subject was asked to lean forward and place his hands without bouncing over the measuring scale on the top of the box for at least one second. Bending of knee was not allowed. The score was expressed in number of centimeters. Three trials were given and the highest score was recorded.

Experimental design: pretest-posttest group design was used for this study. Three groups were created, two experimental group and one control group. 15 girls were in each group. First experimental group preformed Suryanamaskar with 2 minutes pace, second experimental group performed with 4 minutes pace and third served as a control group. Total treatment duration was six weeks. Flexibility was measured by sit and reach test before (prettest) and after (posttest) the treatment of all three groups.

Adjusted means for data on flexibility of different groups during post-test shows in table 2.

Since, the analysis of covariance for flexibility scores was found significant difference among groups. Therefore post hoc comparison LSD test was applied and it is presented in table number 5.

Table 1: Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type I Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>76.59</td>
<td>1</td>
<td>76.596</td>
<td>23.55</td>
<td>.00</td>
</tr>
<tr>
<td>Groups</td>
<td>184.68</td>
<td>2</td>
<td>92.340</td>
<td>28.39</td>
<td>.00</td>
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<tr>
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<td>84.56</td>
<td>26</td>
<td>3.252</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18036.25</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>345.84</td>
<td>29</td>
<td></td>
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</tr>
</tbody>
</table>

Since, the analysis of covariance for flexibility scores was found significant difference among groups. Therefore post hoc comparison LSD test was applied and it is presented in table number 5.

Table 5 indicates that there is a significant difference found between pace 2 and pace 4 (p = 0.001) as the p-value is less than 0.05. There is also significant difference found between pace 2 and control group (p = 0.001) as the p-value is less than 0.05. There is a significant difference found between pace 4 and control group (p = 0.00) is less than 0.05.
4. Discussion
The objectives of the study were to determine the effect of suryanamaskar on flexibility and to compare effect of different pace of Suryanamaskar on flexibility. The finding of study revealed that there was a significant improvement found in flexibility due to regular practice of suryanamaskar in both experimental groups (pace 2 and pace 4). The finding is in agreement with the results of (Shankar & Pancholi, 2011) [4,8]. Flexibility depends more on the soft tissues (ligament, tendon and muscles). Muscle, ligament and tendon have an extensibility property. It’s mean due to regular stretching exercises increase extensibility of muscles, ligaments and tendon. In same way in Suryanamaskar practice we perform flexion and extension or hyperextension of hip joint which improve flexibility of hip joint, lower back and posterior thigh muscles.

There was significant difference between experimental group (pace 2) and control group as well as between experimental group (pace 2) and control group and there was also a significant difference found between experimental (pace 2) and experimental (pace 4) group on flexibility. When we compare both paces than we found that pace 4 adjusted post mean is 27.31 which is greater than pace 2 adjusted post mean 24.34 this indicated that flexibility improved more in pace 4 as compare pace 2 group. In this way present study confirmed that practice of suryanamaskar for six weeks are sufficient to bring out significant improvement on flexibility of hip joint with both paces (pace 2 and pace 4).

5. References