INDIAN JOURNAL OF PHYSICAL EDUCATION, SPORTS MEDICINE AND EXERCISE SCIENCE
(Bi-Annual)


An Official Journal of LAKSHMIBAI NATIONAL INSTITUTE OF PHYSICAL EDUCATION GWALIOR
# TABLE OF CONTENTS

1. **EFFECT OF STATIC STRETCH OF HIP FLEXORS MUSCLES ON VERTICAL JUMP-A CONTRARY**  
   *Dr. Amar Kumar*  
   5

2. **A STUDY ON EFFECTIVENESS OF SWIMMING ON FITNESS**  
   *Dr. Ashoke Mukharjee*  
   8

3. **INFLUENCE OF PARENTS IN SPORTS COMPETITION: A COMPARATIVE ANALYSIS OF COACHES AND PLAYERS POINT OF VIEW**  
   *Mr. Ashwani Saini, Dr. Jogiswar Goswami*  
   11

4. **ANALYSIS OF ANTHROPOMETRIC VARIABLES AS PREDICTIVE FACTOR FOR FEMALE LONG JUMPERS**  
   *Mrs. Deepti Joshi, Prof. (Dr.) Ajay Kumar*  
   16

5. **NITRATE SUPPLEMENTATION IMPROVES ONE KM TIME TRIAL PERFORMANCE OF UNIVERSITY RUNNERS**  
   *Dr. Dileep Tirkey, Dr. (Mrs.) Reeta Venugopal, Dr. Shabir Kumar Anant*  
   19

6. **EFFECT OF SIX WEEKS TRAINING ON SELECTED LINEAR KINEMATIC VARIABLES FOR THE DEVELOPMENT OF SMASH ABILITY AMONG NOVICE BADMINTON PLAYERS**  
   *Hemantajit Gogoi, Dr. Y. S. Rajpoot*  
   22

7. **SPORT MOTIVATION LEVEL OF UTTAR PRADESH U-19 AND RANJI MALE CRICKET TEAMS: A COMPARATIVE STUDY**  
   *Hem Chandra Joshi, R.S. Rajpurohit, Vishal Singh*  
   26

8. **COMPARISON OF PERSONALITY TRAITS BETWEEN COLLEGE LEVEL SPORTS WOMEN AND NON-SPORTS WOMEN**  
   *Jaiprakash Bhukar*  
   30

9. **EFFECTS OF PLYOMETRIC TRAINING AND RESISTANCE TRAINING ON AGILITY OF TENNIS PLAYERS**  
   *Dr. Madan Singh Rathore*  
   32

10. **EFFECT OF SIX WEEKS DYNAMIC EFFORT LIFTING WITH HEAVY TRAINING PROGRAM IN IMPROVEMENT OF BENCH PRESS PERFORMANCE OF POWERLIFTING**  
    *Mr. Mukesh Narwariya, Mr. Bhargab Borah*  
    35
<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>A STUDY ON PHYSIOLOGICAL PROFILE OF INTER UNIVERSITY SQUASH PLAYERS</td>
<td>Neeraj Singh</td>
</tr>
<tr>
<td>12</td>
<td>AN INVESTIGATION OF BIO-MOTOR ABILITIES DEVELOPMENT PATTERN OF TRAINED INDIAN GIRLS: A CROSS SECTIONAL STUDY</td>
<td>Mr. S. C. Negi, Hem Chandra Joshi</td>
</tr>
<tr>
<td>13</td>
<td>EFFECT OF AQUATIC ACTIVITY AND YOGIC PRACTICES ON PEAK FLOW RATE</td>
<td>Pawan Kumar Roy, Dr. Brij Kishore Prasad</td>
</tr>
<tr>
<td>14</td>
<td>COMPARISON OF MENTAL TOUGHNESS BETWEEN PLAYERS OF TEAM GAMES AND INDIVIDUAL GAMES</td>
<td>Dr. Pushpendra Purashwani</td>
</tr>
<tr>
<td>15</td>
<td>AN ANALYTICAL COMPARISON OF SUPERSTITION BETWEEN MEN AND WOMEN PADDLERS</td>
<td>Dr. Pushpendra Purashwani</td>
</tr>
<tr>
<td>16</td>
<td>EFFECT OF SURYA-NAMASKAR ON CHOLESTEROL LEVEL</td>
<td>Mr. Subhash S. Dadhe</td>
</tr>
<tr>
<td>17</td>
<td>COMMON LOWER LIMBS INJURY AMONG FIELD HOCKEY PLAYERS</td>
<td>Dr. Sujay Bisht</td>
</tr>
<tr>
<td>18</td>
<td>ASSOCIATION BETWEEN BALL VELOCITY AND HAND GRIP STRENGTH OF MALE CRICKET PLAYERS</td>
<td>Sukanta Goswami, V. K. Srivastava, Yajuendra Singh Rajpoot</td>
</tr>
<tr>
<td>19</td>
<td>ASSESSMENT OF RELATIONSHIP AMONG THREE SELECTED METHODS OF LONGITUDINAL PLANTAR ARCH IN PHYSICALLY ACTIVE ADULTS</td>
<td>Dr. V. D. Bindal, Gayatri Pandey, Padmakar</td>
</tr>
<tr>
<td>20</td>
<td>COMPARISON OF DIFFERENT PACES OF SURYANAMASKAR ON FLEXIBILITY OF SCHOOL STUDENTS</td>
<td>Dr. Vivek Singh , Dr. Anurodh Singh Sisodia</td>
</tr>
<tr>
<td>21</td>
<td>INFLUENCE OF LOADING PHASE ON ATTAINING MAXIMUM HEIGHT DURING BADMINTON SMASH</td>
<td>Y. S. Rajpoot</td>
</tr>
</tbody>
</table>
EFFECT OF STATIC STRETCH OF HIP FLEXORS MUSCLES ON VERTICAL JUMP- A CONTRARY

Dr. Amar Kumar
Assistant Professor, LNIPE Gwalior

ABSTRACT

Although hip flexion is integral in sports, exercises for development of hip flexion are seldom emphasized in strength and conditioning for sports performance. The study aimed to determine the effect of static stretch of hip flexors on vertical jump performance. Twenty students of the Lakshmibai National University of Physical Education, Gwalior were selected as subjects for the study by employing purposive sampling. Subjects were randomly assigned in two groups. Experimental (n = 10) and control Group (n=10). Three weeks training were imparted to experimental group. Kneel Growing Stretch or Simpson Stretch, Seated Butterfly Stretch, Pigeon Pose techniques were used to stretch hip flexor muscles. Vertical jump was used to measure the explosive strength. Pre and post data were collected on maximum vertical jump test by vertical power jump and measured to the nearest 1cm. Subjects were allowed to perform three trials out of which the highest jump was used as the comparison measure for pre and post scores. Data were collected and the effect of static stretching of Hip flexors muscles on vertical jump performance for each of the 2 groups were analyzed by using Analysis of Covariance (ANCOVA) followed by a Bonferroni Test post hoc test to determine the exact site of statistical significance. Level of significance was set at 0.05. This study clearly revealed significant effect of static stretching of Hip flexors muscles on vertical jump performance. This will help to increase stride length of athlete, as well as to prevent hamstring pulls and low-back pain. Dean R.S (2005) and Wakefield (2014) also found similar results.

Key Words: Hip Flexor, Simpson Stretch and Vertical Jump

INTRODUCTION

It is a well known fact that static stretching hampers the explosiveness of the muscles being stretched. In general, we're not big fans of static stretching, especially before performing explosive activities. This stretch is a major exception. Most athletes have super-tight hip flexors. When athletes jump, tight hip flexors cause a lot of friction, preventing athlete from fully extending at the hip, as well as reaching as high as you can. The functions of hip flexors are to flex the hip joint. All the muscles Collectively known as Iliopsoas muscles. The major muscles of hip flexors are Psoas Major, Iliacus, Rectus Femoris, Sartorious and Gracilis. Hip flexors helps to produce torque as well as the extension of Lumbar region. Some researcher believes that loosening of Hip flexors also works great for people with low back pain, hip pain, and postural and biomechanical issues related to too much of an anterior pelvic tilt. That's why athletes, especially runners, soccer players, and martial artists, are especially prone to hip flexor injuries that result in hip flexor pain. The researcher wants to see the actual effect of static stretching of hip flexors on vertical jump performance rather than dynamic stretching.

METHODS

Twenty students of the Lakshmibai National Institute of Physical Education, Gwalior were selected as subjects for the study by employing purposive sampling. The age level of the subjects ranged from eighteen to twenty four years. Subjects were randomly assigned in two groups. Experimental (n = 10) and control Group (n=10). Players had represented inter university level and had no lower extremity injuries or any bone or joint disparities within the past years. By reviewing the literature and
consultation with experts, the researcher carried out an intensive study and selected Hip Flexors muscles as variable for this study. Following Stretching protocols were followed before sergeant jump

Exercise Protocol

Kneel Growing Stretch or Simpson Stretch-
Athlete asked to get in a lunge position with their left knee on the ground and their right foot as far forward as possible. They asked to drive their hips as far forward as possible by keeping chest up. They were asked to keep left thigh 45 degrees to the floor by keeping left hand high and twist slightly to their right by looking over your right shoulder.

Seated Butterfly Stretch
Subject asked to sit on the floor, back straight, shoulders down, abs engaged, soles of the feet together in front of you and knees bent to the sides. Subject asked to pull their heels towards themselves while simultaneously relaxing knees towards the floor. Breathe deeply and hold for 30sec.

Pigeon Pose
Subjects asked to take pushup (plank) position on hand and toes and asked to lift their right foot off the floor and slide their right knee forward towards their left hand so that knee and outer ankle rests on the floor. Further they asked to slide their left leg back as far as comfortable by keeping hips square to the floor and leveled. Breathe slowly and steadily as while hold the stretch, pushing hips towards the floor but keeping the back long, shoulders down and chest lifted and hold it for 30 sec.

Explosive strength
Explosive strength was measured by Sargent jump. Subject asked to stand by the side of a wall keeping the feet flat on the ground and asked to lift his hand closest to the wall. The point of the fingertips was marked and recorded for standing reach height. The athlete asked to jump vertically as high as possible using both arms and legs to assist in projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height was the score.

After doing general warm up for 10 minutes. The above mentioned stretching protocol were followed by each athletes. Each exercise performed thrice as mentioned above. Three weeks training were imparted to experimental group. Pre and post data were collected of explosive strength by sargent jump test and measured to the nearest 1cm. Subjects were allowed to perform three trials out of which the highest jump was used as the comparison measure for pre and post scores.

RESULTS

Data were analyzed by using Analysis of Covariance (ANCOVA) followed by a Bonferroni Test post hoc test to determine the exact site of statistical significance are presented in Table -1 and Table -2 respectively. Level of significance was set at 0.05.

Table-1
Analysis of Covariance of Static Stretching on Vertical Jump Performance

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>106.108</td>
<td>1</td>
<td>106.108</td>
<td>44.549*</td>
</tr>
<tr>
<td>Group</td>
<td>166.591</td>
<td>1</td>
<td>166.591</td>
<td>69.942*</td>
</tr>
<tr>
<td>Error</td>
<td>40.492</td>
<td>17</td>
<td>2.382</td>
<td></td>
</tr>
</tbody>
</table>

* Significant, F_{0.05}(1,17)= 4.45

Table-2
Bonferroni Test

<table>
<thead>
<tr>
<th>(I) Group</th>
<th>(J) Group</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Experimental</td>
<td>-5.825*</td>
<td>.697</td>
</tr>
<tr>
<td>Experimental</td>
<td>control</td>
<td>5.825*</td>
<td>.697</td>
</tr>
</tbody>
</table>

Based on estimated marginal means*.
The mean difference is significant at .05.
DISCUSSION AND CONCLUSIONS

This study clearly revealed significant effect of static stretching of Hip flexors muscles on vertical jump performance. It was also revealed that there was a significant difference in control group and experimental group.

By static stretching them immediately before you jump, you not only stretch them out, but also “put them into sleep” due to the long and slow stretch. This causes less friction at the hip when you jump. This results in higher jumps. You will be amazed at how well this works. (By the way, the hip flexors are the only muscles you would ever want to static stretch before jumping.) It is also a good idea for athletes to get in the habit of stretching their hip flexors every day, not just before jumping. This will help to increase your stride length when you run, as well as prevent hamstring pulls and low-back pain.

Dean R.s (2005) and Wakefield (2014) also found similar type of results. Finally, It was concluded that before going any explosive movement hip flexors should be stretch statically rather than dynamic. It would give significant improvement in power movements.

REFERENCES


Michael, R. McGuigan., (2006) "The importance of isometric maximum strength in college wrestlers", School of Exercise, Biomedical and Health Sciences, Edith Cowan University, Joondalup, WA, Australia

A STUDY ON EFFECTIVENESS OF SWIMMING ON FITNESS

Dr. Ashoke Mukharjee
Asst. Professor, Visva-Bharati, Santiniketan.

ABSTRACT

Flexibility is an integral component of physical conditioning in swimmers. Regular training of swimming helps to increase the ability of muscles to pull swimmers through the water and the less turbulence you create as you move through the water, the faster you will go. The aim of this investigation was to see the effect of regular free style swimming on fitness (Health Related Physical Fitness) of Visva-Bharati girl students. 30 Visva-Bharati girl students who were participating 40 min. regular swimming (free style technique) for 30 days, has been tested pre test and post test on selected components of health related fitness. Flexibility, muscular strength and endurance have been improved by regular swimming. Regular swimming has improved the health related fitness status of Visva-Bharati girl students.

Key words : Flexibility, muscular strength, free style, health related fitness.

INTRODUCTION

Swimming delivers all the key benefits of an effective fitness program, without stressing out your precious joints. The built-in resistance of water promotes muscle strength, endurance and flexibility all things you need to be a good swimmer. The resistance benefits of training in water combined with the aerobic activity of swimming mean you hit all five components of fitness swimming. That makes swimming one of the best fitness bargains around (Ayala).

Flexibility is an integral component of physical conditioning in swimmers. Flexibility is the ability to achieve optimal positions in the water for the application of force and the minimization of drag. Efficiency of movement requires the appropriate amount of joint motion (Blanch & Fitzgerald 1998). It is well known that poor flexibility predisposes the swimmer to injury (Fowler & Webster-Bogart 1996). Flexibility, leg strength and endurance are important component in swimming. Emphasis should be placed on the achievement and maintenance of flexibility in related joints, strength and endurance of leg and abdominal muscles both. Excessive flexibility, in the absence of adequate control, may also be detrimental to swimmers performance or predispose to injury. In free style swimming the leg strength, cardiovascular endurance is one of the main components of swimmers success.

In swimming, the training of flexibility helps to increase the ability of muscles to pull swimmers through the water and the less turbulence you create as you move through the water, the faster you will go (Hagerman 1995). However, there is conflicting information about the influence of flexibility on swimming results. For example, Maglischo (1982) and Rutemiller (1990) did not find significant relationships between joint flexibility and swimming performance. The aim of this investigation was to study the possible relationships between regular swimming and selected health related fitness components of Visva-bharati girl students (free style swimmers).
METHODS

30 Visva-Bharati girl students aged 11 to 18 years have participated in 40 minutes regular swimming (free style technique), has been tested pre and post test on selected health related physical fitness components namely flexibility, muscular strength & endurance and body composition. The study was conducted during the summer vacation. The testing procedures have been explained properly to the students and they have given their consent to participate in the experiment. Body Mass Index (BMI) was calculated by weight in Kg/height in meter² to measure the body composition. One minute bent knee sit ups were conducted to measure the abdominal strength and endurance. The flexibility was measured by sit and reach test in cm. The leg strength was measured through vertical jump in cm. The students have practiced swimming in the morning as well as in evening. Descriptive statistics were used. Further Paired 't' test has been applied to see the significant difference at .05 level of confidence.

RESULTS

TABLE – 1
Descriptive statistics of health related physical fitness components

<table>
<thead>
<tr>
<th>Components</th>
<th>Mean Pre test</th>
<th>SD Pre test</th>
<th>Mean Post test</th>
<th>SD Post test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal strength &amp; endurance</td>
<td>22.46</td>
<td>7.69</td>
<td>25</td>
<td>6.93</td>
</tr>
<tr>
<td>Flexibility</td>
<td>7.3</td>
<td>5.15</td>
<td>9.2</td>
<td>4.50</td>
</tr>
<tr>
<td>BMI</td>
<td>25.89</td>
<td>3.86</td>
<td>25.78</td>
<td>3.59</td>
</tr>
</tbody>
</table>

Mean and standard deviation of various health related fitness components has been shown by graphical representation in Fig.1 to 3.

Fig. 1: Muscular strength and endurance of Visva-Bharati girl students

Fig. 2: Flexibility of Visva-Bharati girl students

Fig. 3: BMI of Visva-Bharati girl students
TABLE - 2
Paired 't' test of health related physical fitness components

<table>
<thead>
<tr>
<th>Component</th>
<th>df</th>
<th>'t'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscular strength &amp; endurance</td>
<td>29</td>
<td>5.17*</td>
</tr>
<tr>
<td>Flexibility</td>
<td>29</td>
<td>4.98*</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td>0.93</td>
</tr>
</tbody>
</table>

* Significant, $t_{0.05}(29) = 1.699$

Table - 2 is showing the significant difference of pre test and post test of regular swimming for muscular strength & endurance, flexibility as the calculated 't' value i.e. 5.17, 4.98, respectively is greater than the tabulated value is 1.699. Also there is no significant difference found in the BMI result as the calculated 't' value 0.93 is lesser than tabulated value i.e. 1.699.

DISCUSSION AND CONCLUSIONS

Finding from statistical analysis have revealed and established significant differential training effect of swimming on selected health related physical fitness components of the Visva-Bharati girl students. As revealed by statistical analysis significant differences of pre & post training effect of 4 weeks regular swimming can be seen.

It is well known that in some flexibility tests, for example simple sit-and-reach test, results depend on anthropometrical parameters. Swimming burns calories and it is an excellent fitness activity for achieving healthy body composition and fibulas tone (Ayala), The flexibility has been improved due to wide range of motions involved in swimming when strokes are performed (Emmet Hines, 2008), may be the reason of improving of flexibility.

Exercise in water adds natural resistance to the work out, which helps to build stronger muscles and upping resistance of water can build both muscular endurance and strength (Ayala), may be the reason of improvement of muscular strength and endurance.

Swimming burns calories and it is an excellent fitness activity for achieving healthy body composition and fibulas tone (Ayala), if it is practiced continuously. It may be the reason only 4 weeks swimming could not show significant improvement in Body composition. Further by doing swimming if you want to get training effect for a certain competition or lose weight by specific deadline, this can be problematic (Brian willett). Though a little improvement in mean BMI can be seen.

Four week regular swimming classes of Visva-Bharati girl students have shown the following changes;
1. The muscular strength and endurance has been improved.
2. The flexibility has been increased.
3. There is no significant changes can be seen in BMI.

REFERENCES:

INFLUENCE OF PARENTS IN SPORTS COMPETITION: A COMPARATIVE ANALYSIS OF COACHES AND PLAYERS POINT OF VIEW

Mr. Ashwani Saini
Research Scholar ASPESS, Amity University, Noida (U.P)

Dr. Jogiswar Goswami
Assistant Director ASPESS, Amity University, Noida (U.P)

ABSTRACT

The aim of this study was to examine the influence of the parents in competitive performance in tennis. Tennis is an individual sport where parents are very much involved in the training and the competitions of the players at junior level. Coaches and players perception was assess to understand the influence of parents in competitive performance of the players in tennis. Coaches and players point of view regarding parent's protocol before, during and after the competition was assessed with the help of self-made questionnaire. 30 coaches who were registered and certified as a coach and 30 junior tennis players of 12 to 18 years registered with All India Tennis Association, were selected as the participant. Content Validity of the questionnaire was established with the help of experts view. Split Half Method was used to set the reliability of the questionnaire. Findings revealed that the parents can influence the competitive performance in tennis and it was suggested to educate parents regarding tennis and competitions.

Key word: Competition, Perception, Content Validity

INTRODUCTION

Tennis is one of the popular sports worldwide. Tennis is played for recreation and as a profession by a large section of the society around the world. In the last few decades, the fan following of the Tennis has grown up by leaps and bounds. Children are taking up Tennis as a sport that not only provides immense joy but also provides an opportunity to make a career. Tennis is an Olympic sports and it has difference level and types of competitions e.g. junior, senior, singles and doubles, national and international. There is huge difference between leaning the sports and playing in a competition. Due to individual nature of tennis parents have to fulfill many roles in tennis and competitions, Paying for match fees, Traveling with the child for tournament, supporting the child before, during and after the competitions. It can be challenging if the parent have not played the game themselves. The role and responsibilities of the parents depend upon the level at which the child is playing Tennis.

Parents not only influence the participation of the child in sports, but also affect the enjoyment and feeling of the child towards sports (Wheeler, 2012). Several research studies have supported this fact that parents can have an influence on the child's enjoyment, motivation
and competency in the sports. Parent involvement and feedback to the child can have a lasting effect on the child self-esteem and competency. When a parent emphasizes commitment to the sports or improving the skills, it influences the child motivation and effort. On the other hand, the parent's interaction before, during, and after training or competitions can be a cause of anxiety and stress. Therefore, parents affect the performance and the development of a player. Parents are not only the reason of success but they can be a problem as well. Many junior coaches have indicated that parents can be a cause of stress. Even players have also reported that parents behavior and involvement can influence their performance (Camilla J and et al. (2011); (Harwood and Swain, 2002); (Gould et al., 2008); (Larry Lauer & et al. (2010)) On the other hand, there are many evidences which indicate that parents have created an excellent achievement oriented environment and played a significant role in the success of the Tennis players.

**METHODS**

The purpose of the study was to assess and compare the Point of view of coaches and players towards the parents influence on competitive performance in tennis. After investigating the literature the influence of the parents in competitive performance namely Behavior, Performance, Efficiency and Morale were selected A self-made questionnaire was developed with Likert scale. The construction of the instrument went through various stages, initially beginning with framing and construction of questions on different sub variable. To establish the content validity, reviews of the expert were taken. Before using the questionnaire on actual subjects, reliability of the tool was established by using split-half method.

30 coaches of the Delhi state, who were certified and registered with the All India Tennis Association and an equal number of ranked Junior male Tennis players of the Delhi state between the age of 12 to 18 and who were registered with All India Tennis Association, were selected randomly as the participants for the study.

The scholar had personally visited various Tennis academies located in the Delhi state to collect the data. The scholar had personally administered the questionnaires to the participants. The purpose and objectives of the study were informed to them. Clear and specific instructions were given to the participants before filling up the questionnaire. They were informed to choose one option out of the five, which comes in their mind after reading the statement.

To statistically analyze the data non parametric statistics, Mann-Whitney U test was used. The level of significance was set at 0.05.

**RESULTS**

Data analyzed with the help of Mann-Whitney U test are presented in the following Table.
### Table 1

**Influence of Parents in Competitive Performance: Coaches and Players point of View:**

Responses from coaches and Players (frequency) (N=60)

<table>
<thead>
<tr>
<th>Statements</th>
<th>-</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
<th>Mean Rank</th>
<th>Z Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Parent’s expectation can influence player’s performance.</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>30.55</td>
<td>448.5</td>
<td>0.02</td>
</tr>
<tr>
<td>Coaches point of view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players Point of view</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>13</td>
<td>30.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Parents motivate the child for match preparation (e.g., stretching,</td>
<td>0</td>
<td>3</td>
<td>16</td>
<td>7</td>
<td>4</td>
<td>28.2</td>
<td>381</td>
<td>1.07</td>
</tr>
<tr>
<td>warming up, readiness of equipment).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coaches point of view</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players Point of view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Parents distracts the child during the competition (e.g., by verbal</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>18</td>
<td>2</td>
<td>38</td>
<td>225</td>
<td>3.45</td>
</tr>
<tr>
<td>communication and gestures).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coaches point of view</td>
<td>4</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players Point of view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Parents provide positive feedback following matches.</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>25.78</td>
<td>308.5</td>
<td>2.16</td>
</tr>
<tr>
<td>Coaches point of view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players Point of view</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>13</td>
<td>6</td>
<td>35.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Parents provide appropriate disciplined for the player for better</td>
<td>0</td>
<td>3</td>
<td>17</td>
<td>6</td>
<td>4</td>
<td>23.52</td>
<td>240</td>
<td>-3.2</td>
</tr>
<tr>
<td>sportsmanship.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coaches point of view</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>14</td>
<td>37.48</td>
<td>240</td>
<td>-3.2</td>
</tr>
<tr>
<td>Players Point of view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Parents motivates child to behave unprofessionally and non-sportsmanship (e.g. false call, argue with umpires, etc.)</td>
<td>9</td>
<td>13</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>32.97</td>
<td>376</td>
<td>1.16</td>
</tr>
<tr>
<td>Coaches point of view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players Point of view</td>
<td>14</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>28.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level
Table 1 depicts that mean rank value of the coaches and players point of view regarding influence of parent's expectation on performance, which was 30.55 and 30.45 respectively. Mann-Whitney U obtained value for it was 448.5, which was statistically insignificant at 0.05 level as the p values was 0.981.

Further mean rank value of the coaches and players point of view regarding parents motivation and help in match preparation was 28.2 and 32 respectively and the Mann-Whitney U obtained value for it was 381, which was statistically insignificant at 0.05 level as the p values was 0.281.

The mean rank value of the coaches and players point of view regarding parents influence during the competition was 38 and 23 respectively and the Mann-Whitney U obtained value for it was 225, which was statistically significant at 0.05 level as the p values was 0.001.

The mean rank values coaches and player's point of view regarding parents providing positive feedback after a match was 25.78 and 35.22 and the Mann-Whitney U obtained value for it was 308.5, which was statistically significant at 0.05 level as the p values was 0.03.

As far as providing discipline for better sportsmanship is concerned mean rank value of the coaches and players point of view was 23.52 and 37.48 respectively and the Mann-Whitney U obtained value for it was 240, which was statistically significant at 0.05 level as the p values was 0.001.

In morale and ethical values of the sports, the mean rank value of the coaches and players point of view was 32.97 and 28.3 respectively and the Mann-Whitney U obtained value for it was 376, which was statistically Insignificant at 0.05 level as the p values was 0.244

**DISCUSSION AND CONCLUSIONS**

It was concluded that there was no significant difference between the coaches and player point of view. Both the coaches and players perceived that parent's expectation always influences the performance of the players in competitions. These findings are in line with the findings of Julien. E. Bois and et al. (2010).

It was concluded that there was no significant difference between the coaches and player point of view. Both the coaches and players perceived that parent's sometime motivate the child for match preparation.

It was concluded that there was significant difference between the coaches and player point of view. The coaches felt that tennis parents frequently distract the child during the competition with their verbal and non-verbal communication. But the players felt parent's rarely distract the player during the competition. J Knight (2010) had also assessed the influence of parents on the child performance during the match.

It was concluded that there was significant difference between the coaches and player point of view. The coaches felt that tennis parents sometime provide positive feedback after a match but at the same time the players felt that parent's frequently provide positive feedback following matches. A study by Harwood, C.G. & Swain A.B. (2002) discussed a deeper insight about the parent's influence on the competitive performance.

It was concluded that there was significant difference between the coaches and player point of view. The coaches felt that tennis parents sometime provides discipline for sportsmanship But the players felt parent's always provide appropriated discipline for sportsmanship. Hoyle R. H & Leff S.S. (1997) examined the involvement of the parents, which affects the self-esteem and the other characteristics of the junior Tennis players.
Findings revealed that parents can influence the self-efficacy and the sportsmanship of the players. It was concluded that there was no significant difference between the coaches and player point of view. A study by J Knight (2010) has also revealed the fact that parents show respect to the ethics and morale during the competitions and they can influence the aspects related to the competitive performance.

REFERENCES

Cox Ricahrd, (2011) Sports Psychology: Concept and Application, McGraw-hill,


Crespo, Machar Reid and Ann Quinn (2006) Tennis Psychology: 200+ practical drills and research, International Tennis Federation, ITF ltd,


Harwood, C. G and Swain, A. B, (2002) The development and activation of achievement goals within tennis- A player, parent, and coach intervention, Back Abstract Descriptors Top Sport Psychologist, 16(2), 111-137,


ANALYSIS OF ANTHROPOMETRIC VARIABLES AS PREDICTIVE FACTOR FOR FEMALE LONG JUMPERS

Mrs. Deepti Joshi
Department of Physical Education, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed University, Allahabad, Uttar Pradesh.

Prof. (Dr.) Ajay Kumar
School of Physical Education, Devi Ahilya Vishwavidyalay, Indore (M.P.)

ABSTRACT
Anthropometry is a scientific specialized closely allied to physical education, sports science, sports medicine, human biology, physical anthropology and several medicine disciplines. Assessment of human physical performance through anthropometry helps to evaluate the physical structure and the performance of individual. For the purpose of this study 55 female long jumpers (23 National Championship and 32 from Inter University) were selected as a subject. Age group of athletes was 17 - 28 years. To carry out this study Single Group Experimental Research design was used. The test item selected for this study was anthropometric variables i.e. Height, Fore Leg Length, Thigh Length, Leg Length, Trunk Length, Sitting Height, Shoulder Width, Hip Width, Weight. The data on jumping performance along with anthropometric measurements was examined by Pearson's Product Movement Correlation in order to find out the relationship of jumping performance to each of the anthropometric variables separately. Multiple Linear Regression analysis was done in order to predict jumping performance on the basis of anthropometric measurements. The analysis was done with the help of SPSS 16.0 software. The level of significance to check the relationship obtained by Pearson's Product Movement Correlation was set at 0.05. Results of the study shows that significant relationship was found out between Height, Leg Length, Shoulder Width and Hip Width among anthropometric variables with long jump performance but Significant difference was not found out in fore leg length, Thigh length, trunk length, sitting height and weight in anthropometric variables with long jump performance.

Key Words: Long Jump, Performance, Multiple Regression

INTRODUCTION
Proficiency in any sport requires an ideal integration of numerous abilities developed to an ideal degree. However, performance measures of these abilities do vary from activity to activity. The long jump is a track and field event in which the performance of an athlete in sports does not depend only upon the physical fitness components but several other factors also contributed to his success, such as anthropometric variables. Anthropometry is a scientific specialized closely allied to physical education, sports science, sports medicine, human biology, physical anthropology and several medicine disciplines. Assessment of human physical performance through anthropometry helps to evaluate the physical structure and the performance of individual. So anthropometry is a science which deals with human body measurements and sports person...
are selected on the basis of bodily characteristics for a particular sports or event. Therefore, a study of the analysis of Anthropometric variables as predictive factors for female long jumpers is important for better understanding of the important aspects of physique for the long jump performance. The purpose of this study is to determine the anthropometric attributes of national level female long jumpers. Besides that, this research will also help to determine the anthropometric characteristics that are the significant contributing factors to long jump performance.

METHODS

For the purpose of this study 55 female national level long jumpers were selected as a subject. Age group of athletes was 17 - 28 years. To carry out this study Single Group Experimental Research design was used. The test item selected for this study was anthropometric variables i.e. Height, Fore Leg Length, Thigh Length, Leg Length, Trunk Length, Sitting Height, Shoulder Width, Hip Width, Weight. Standing height, fore leg length, thigh length, leg length, trunk length and sitting height was measured by steel tape. Shoulder width and hip width was measured by modified sliding calliper and Weight was measured by weighing machine. Performance of an athlete's was recorded during the competition. The data on jumping performance along with anthropometric measurements was examined by Pearson's Product Movement Correlation in order to find out the relationship of jumping performance to each of the anthropometric measurements separately. Multiple Linear Regression analysis was done in order to predict jumping performance on the basis of anthropometric measurements. The level of significance to check the relationship obtained by Pearson's Product Movement Correlation was set at 0.05.

RESULTS

Table-1

Descriptive Analysis of Anthropometric Variables

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Anthropometric Variables</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Height</td>
<td>153.7</td>
<td>174</td>
<td>164.27</td>
<td>4.285</td>
</tr>
<tr>
<td>2</td>
<td>Fore Leg Length</td>
<td>39</td>
<td>50</td>
<td>43.69</td>
<td>2.327</td>
</tr>
<tr>
<td>3</td>
<td>Thigh Length</td>
<td>40</td>
<td>52.5</td>
<td>45.70</td>
<td>2.400</td>
</tr>
<tr>
<td>4</td>
<td>Leg Length</td>
<td>80.5</td>
<td>97</td>
<td>87.90</td>
<td>3.070</td>
</tr>
<tr>
<td>5</td>
<td>Trunk Length</td>
<td>41.2</td>
<td>62.6</td>
<td>54.41</td>
<td>3.866</td>
</tr>
<tr>
<td>6</td>
<td>Sitting Height</td>
<td>76.9</td>
<td>89.5</td>
<td>82.32</td>
<td>2.823</td>
</tr>
<tr>
<td>7</td>
<td>Shoulder Width</td>
<td>29.8</td>
<td>39</td>
<td>35.57</td>
<td>1.829</td>
</tr>
<tr>
<td>8</td>
<td>Hip Width</td>
<td>27.1</td>
<td>45</td>
<td>32.20</td>
<td>3.665</td>
</tr>
<tr>
<td>9</td>
<td>Weight</td>
<td>42.5</td>
<td>59.5</td>
<td>51.52</td>
<td>3.617</td>
</tr>
</tbody>
</table>

Table No-1 depicts the descriptive analysis of selected anthropometric variables (Independent Variable). Mean values of anthropometric variables Height, Fore Leg Length, Thigh Length, Leg Length, Trunk Length, Sitting Height, Shoulder Width, Hip Width and Weight are 164.27, 43.69, 45.70, 87.90, 54.41, 82.32, 35.57, 32.20, and 51.52 respectively. Standard deviation values of anthropometric variables Height, Fore Leg Length, Thigh Length, Leg Length, Trunk Length, Sitting Height, Shoulder Width, Hip Width and Weight are 4.285, 2.327, 2.400, 3.070, 3.866, 2.823, 1.829, 3.665, and 3.617 respectively.

Fig. 1: Mean and Standard Deviation Values of Anthropometric Variables of Female Long Jumpers
It is revealed from table no 1 relationship between anthropometric variables (Independent variables) and Long jump performance (Dependent variables). Significant relationship was found between Height (r = 0.391), Leg length (r = 0.260), Shoulder width (r = 0.308) and Hip width (r = 0.352) with Long jump performance. And no significant relationship was found among Fore leg length (r=0.210), Thigh length (r = 0.180), Trunk length (r = -0.190), Sitting height (r = 0.047) and Weight (r = 0.252) with long jump performance.

Table-3
Multiple Correlations Between Anthropometric Variables with the Performance of Female Long Jumpers

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variables Correlated</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Height and Long Jump Performance</td>
<td>0.391*</td>
</tr>
<tr>
<td>2</td>
<td>Fore Leg Length and Long Jump Performance</td>
<td>0.210</td>
</tr>
<tr>
<td>3</td>
<td>Thigh Length and Long Jump Performance</td>
<td>0.180</td>
</tr>
<tr>
<td>4</td>
<td>Leg Length and Long Jump Performance</td>
<td>0.260*</td>
</tr>
<tr>
<td>5</td>
<td>Trunk Length and Long Jump Performance</td>
<td>-0.190</td>
</tr>
<tr>
<td>6</td>
<td>Sitting Height and Long Jump Performance</td>
<td>0.047</td>
</tr>
<tr>
<td>7</td>
<td>Shoulder Width and Long Jump Performance</td>
<td>0.308*</td>
</tr>
<tr>
<td>8</td>
<td>Hip Width and Long Jump Performance</td>
<td>0.352*</td>
</tr>
<tr>
<td>9</td>
<td>Weight and Long Jump Performance</td>
<td>0.252</td>
</tr>
</tbody>
</table>

*Significant r = 0.254

Significant difference found between the means of selected physical fitness variables such as speed and agility, explosive strength of legs, speed of lower extremities and explosive strength, cardio-vascular endurance of school level Hockey and Cricket players.

but in Standing broad jump (explosive strength of legs), 50 yards dash (speed of lower extremities and explosive strength), and 12 min. run & walk (cardio-vascular endurance) Hockey players are better than Cricket players.

DISCUSSION AND CONCLUSIONS

Pate, R.R. (1990) also reported that physical activity and physical fitness are significantly, although moderately, associated in young children. Mean value indicates that in shuttle run (speed and agility) Cricket players are better than Hockey players, it may be due to the cricket players has to run very fast in between the wickets. Whereas hockey players has better in cardio vascular endurance as the nature of hockey game is more aerobic than cricket.

REFERENCES


ABSTRACT
The purpose of the present study was to investigate the effect of Nitrate Supplementation in a form of beetroot juice on one km time trial performance of University runners. Thirty trained distance runners (15 males and 15 females) were selected for the present study. Fifteen subjects were randomly assigned to one of the two groups. The Experimental Group consumed 250 ml Nitrate rich beetroot juice daily for fifteen days and the Control Group did not consume any juice. Both the groups underwent a regular athletics training programme. All the subjects were tested for one km time trial performance before Nitrate Supplementation of beetroot juice and after fifteen days of Nitrate Supplementation of beetroot juice in order to find out the effects of Nitrate supplementation on one km time trial performance. Descriptive Statistics and Analysis of Covariance (ANCOVA) was used. The level of significance was set at 0.05 level. Present study demonstrated that fifteen days of Nitrate Supplementation was proved to be effective (‘f’ value of 5.510 p < .05) in enhancing one km time trial performance of experimental group.

Key words: Nitrate Supplementation, beetroot juice, one km time trial, trained distance runners

INTRODUCTION
Nutritional supplements are used for many purposes. They can be added to the diet to boost overall health and energy; to provide immune system support and reduce the risks of illness and age-related conditions; to improve performance in athletic and mental activities; and to support the healing process during illness and disease. Nutritional supplements include vitamins, minerals, herbs, meal supplements, sports nutrition products, natural food supplements, and other related products used to boost the nutritional content of the diet (Retrieved from http://www.medical-dictionary.thefreedictionary.com). Studies have been conducted to find out effect of beetroot supplementation on endurance related activities. Nutritional supplements are typically used for their actual or anecdotal physiological effects in increasing performance and endurance, health maintenance or preventing injuries (Armsey and Green, 1997; Lawrence et al 2002; and Kreider et al.,2004). The aim of the present study is to investigate the efficacy of nitrate rich beetroot juice on one km time trial performance. Finally, The objective of the study was to examine the effect of fifteen days of Nitrate supplementation in a form of beetroot juice on One km time trial performance in trained distance runners of University level.

METHODS
Thirty trained athletes (15 males and 15 females) of 18 to 28 years of age were selected for the present study. One experimental and one
control groups were made consisting of males and females.

In this study beetroot supplementation was considered as independent variables and One km time trial performance was considered as dependent variable.

In order to find out the effect of beetroot supplementation on a One km time trial performance, Descriptive Statistics and Analysis of Covariance (ANCOVA) was used. The level of significance was set at 0.05 level.

In this present study, nitrate rich beetroot juice (250 ml/day for two weeks) was given to the subjects of experimental group in afternoon after lunch at 2.00 p.m.

**RESULTS**

**Table – 1**

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>Different Groups</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre test</td>
<td>Post test</td>
<td>Pre test</td>
</tr>
<tr>
<td>Mean</td>
<td>3.288</td>
<td>3.094</td>
<td>3.428</td>
</tr>
<tr>
<td>Std. Error of Mean</td>
<td>.108</td>
<td>.0953</td>
<td>.195</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>.418</td>
<td>.369</td>
<td>.757</td>
</tr>
<tr>
<td>Variance</td>
<td>.175</td>
<td>.136</td>
<td>.574</td>
</tr>
<tr>
<td>Skewness</td>
<td>.542</td>
<td>-.554</td>
<td>.085</td>
</tr>
<tr>
<td>Std. Error of Skewness</td>
<td>.580</td>
<td>.580</td>
<td>.580</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>.267</td>
<td>-1.294</td>
<td>-1.726</td>
</tr>
<tr>
<td>Std. Error of Kurtosis</td>
<td>1.121</td>
<td>1.121</td>
<td>1.121</td>
</tr>
<tr>
<td>Range</td>
<td>1.58</td>
<td>1.01</td>
<td>1.94</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.54</td>
<td>2.51</td>
<td>2.46</td>
</tr>
<tr>
<td>Maximum</td>
<td>4.12</td>
<td>3.52</td>
<td>4.40</td>
</tr>
<tr>
<td>N</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

In relation to pre test, table 2 revealed that the obtained 'f' value of 0.389 was found to be insignificant at 0.05 level, since this value was found lower than the tabulated value 4.196 at 1, 28 df.

In relation to post test, insignificant difference was found among experimental and control group pertaining to One km time trial performance since f value of 1.707 was found insignificant at .05 level.
Table – 4
Analysis of Covariance of Comparison of Adjusted Post Test Means of One Km Time Trial Performance in Experimental Group and Control Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>f</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast</td>
<td>.159</td>
<td>1</td>
<td>.159</td>
<td>5.510*</td>
<td>.02</td>
</tr>
<tr>
<td>Error</td>
<td>.778</td>
<td>27</td>
<td>.029</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant, \( f_{05} (1,27) = 4.21 \)

Table 4 revealed that the obtained 'f' value of 5.510 was found to be significant at 0.05 level, since this value was found higher than the tabulated value 4.21 at 1, 27 df.

DISCUSSION AND CONCLUSIONS
The result of the present study revealed that two weeks of supplementation of beetroot juice was proved to be effective ('f' value of 5.510, \( p < .05 \)) in enhancing one km time trial performance of experimental group. Dietary nitrate supplementation with beetroot juice reduced VO\(_2\) during sub maximal exercise (Lansey et. al. 2011) and improved 10–km time–trial performance in trained cyclists (Cermark et al. 2012). Improved endurance exercise performance have been reported by many researchers (Bailey et al. 2009, Larsen et al. 2010, Bescos et al. 2011 and Lansey et al. 2011). A diet rich in vegetables and fruits has been found a beneficial impact on several body functions. These effects may be attributing to the high inorganic nitrate (NO\(_3\)-) content of vegetables, particularly leafy greens and beetroot. NO\(_3\) can be reduced to nitrite and converted to nitric oxide (NO), which affects hemodynamics and muscles metabolic functions. However, evidence is emerging that dietary NO\(_3\) supplementation may also positively impact the physiological responses to exercise. In detail, it has been found that beetroot juice can enhance NO production in the skeletal muscle, which leads to increased blood flow and improved muscle oxygen delivery. Therefore nitrate is considered as a key ingredient in reducing oxygen consumption.

In conclusion, Nitrate rich BR juice supplementation using 250 ml for fifteen days showed an improvement in one km time trial performance of University Runners.

REFERENCES
EFFECT OF SIX WEEKS TRAINING ON SELECTED LINEAR KINEMATIC VARIABLES FOR THE DEVELOPMENT OF SMASH ABILITY AMONG NOVICE BADMINTON PLAYERS

Hemantajit Gogoi
M.P.Ed, LNIPE Gwalior
Dr. Y. S. Rajpoot
Assistant professor, LNIPE Gwalior,

ABSTRACT

In this study the researcher analyses the smash of beginner badminton player before and after 6 week training through kinematic analysis. For the purpose of the study, eighteen male students [N=18] were purposively selected from Lakshmibai National Institute of Physical Education, Gwalior; badminton sport group, age ranging from 18 years to 22 years. The subjects were having mean height 169.32 cm, mean weight 59.28 kg and mean BMI of 20.63. For the purpose of the study, the group was further divided into two sub groups, i.e. experimental and control groups. For analysis purpose four linear variables were considered. Height of C.G. at backswing phase and at hitting phase and Gaining height of centre of mass at backswing phase and Losing height of centre of mass at hitting phase were the linear variables. The values of different kinematic variables were analysed by using “Kinovea” 2D motion analysis software. To find out the effect of six weeks training program on kinematic development of beginner badminton players ANCOVA test was used by means of SPSS software package. The level of significance was set at 0.05.

Key Words : Angular variables, Linear variables, Centre of mass.

INTRODUCTION

Sport, which at once was an empiric field of culture, in the contemporary epoch; it becomes an object of comprehensive research. Together with the tempestuous progress of sports practice and under the effect of its requirements, a vast complex of knowledge of the theoretical, applied, humanitarian and natural science character is being formed in this sphere (Matreyer, 1981). Sports training become the basic forms of preparation of sportsmen. Sport training is based on scientific knowledge, a pedagogical process of perfection through which systematic effect on psycho—physical performance ability and performance readiness aims at leading the sportsman to high and highest performance. It is thoroughly planned and systematically organised, effect on the performance ability and performance readiness, aims at sports perfection and performance improvement as well as at the contest in sports competition (Singh, 2012).

The main aim of the study “Effect of 6 Week Training on Kinematic Development of Smash Ability among Novice Badminton Player” is to analyse the smash of beginner badminton player before and after 6 week training.

METHODS

Seighteen male students [N=18] were purposively selected from badminton sport group of Lakshmibai National Institute of Physical Education; Gwalior. The students were having mean experience of 1.86±0.97 years of playing or learning the sport. And hence they were considered as beginner. Further, the group was divided into two subgroups i.e. control group [N=9] and experimental group [N=9].
Randomized pre-test post-test design was used for the study. All the subjects were tested following the selected criteria of Hicks smash test and analysed by using Kinovea 2D motion analysis software. After the pre-test, the subjects were given the training by the researcher for 6 weeks and again post-test data was collected using the same method.

The modified Hicks Badminton smash test measures the ability of player to quickly move to the shuttlecock and successfully execute a smash shot which will land in a desired area of the court. Videography was employed in order to record the smash technique. The subjects were filmed only in sagittal plane. The camera being used for this purpose was GoPro Hero 3 and had a speed of 60 frames per second. The camera was placed perpendicular to the frontal plane of subject at a height of 95 centimetres and 3 metres away from the singles side line by using tripod. The progressive training programme was administered to the participants of Experimental groups.

In order to find out the effect of six weeks training program on kinematic development of beginner badminton players ANCOVA test was used by means of software “Statistical Package for Social Science (SPSS)” version 22. For the testing of hypothesis, the level of significance was set at 0.05.

RESULTS

Mean and standard deviation of selected linear variables of both the groups are presented in Table 1:

Table 1: Descriptive statistics of linear variables of selected phases

<table>
<thead>
<tr>
<th>Linear variables</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Height of centre of mass at backswing phase</td>
<td>1.22±.19</td>
<td>1.34±.20</td>
</tr>
<tr>
<td>Height of centre of mass at hitting phase</td>
<td>1.20±.10</td>
<td>1.36±.08</td>
</tr>
<tr>
<td>Gaining height of centre of mass at backswing phase</td>
<td>0.28±.09</td>
<td>0.43±.07</td>
</tr>
<tr>
<td>Loss of height of centre of mass while hitting phase</td>
<td>0.02±.18</td>
<td>-0.02±.17</td>
</tr>
</tbody>
</table>

Table 2: Tests of Between-Subjects Effects Dependent Variable: Post Height of Centre of Mass at Backswing Phase

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PreHCMBP</td>
<td>.310</td>
<td>1</td>
<td>.310</td>
<td>20.231</td>
<td>.000</td>
</tr>
<tr>
<td>Group</td>
<td>.080</td>
<td>1</td>
<td>.080</td>
<td>5.241</td>
<td>.037</td>
</tr>
<tr>
<td>Error</td>
<td>.230</td>
<td>15</td>
<td>.015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30.263</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HCMBP= Height of Centre of Mass at Backswing Phase

In Table 2, it is seen that the significant value of pre height of centre of mass at backswing phase was .000, which was significant at 0.05 level of significant (P<0.05). So it can be concluded that initially there was significant difference in both the groups which might affect the main effect of the study. In that case, ANCOVA was the appropriate test for comparing these two groups. On the other hand, the main effect for the groups was significant (F=5.241, P=0.037, P<0.05) and it indicates that there was statistically significant differences between the groups after adjusting the effect of the pre-test.

Table 3: Tests of Between-Subjects Effects for Height of Centre of Mass at Hitting Phase

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PreHCMHP</td>
<td>.035</td>
<td>1</td>
<td>.035</td>
<td>5.252</td>
<td>.037</td>
</tr>
<tr>
<td>Group</td>
<td>.081</td>
<td>1</td>
<td>.081</td>
<td>12.079</td>
<td>.003</td>
</tr>
<tr>
<td>Error</td>
<td>.101</td>
<td>15</td>
<td>.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30.121</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HCMHP= Height of Centre of Mass at Hitting Phase

The Table 3, it is seen that the significant value of pre height of centre of mass at hitting phase was .037, which was significant at 0.05 level of significant (P<0.05). So it can be concluded that initially there was significant difference in both the groups which might affect the main effect of the study. In that case, ANCOVA was the appropriate test for comparing these two
groups. On the other hand, the main effect for the groups was significant (F=12.079, P=0.003, P<0.05) and it indicates that there was statistically significant differences between the groups after adjusting the effect of the pre-test.

Table - 4
Tests of Between-Subjects Effects for Gaining Height of Centre of Mass at Backswing Phase

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PreGHCMBP</td>
<td>.032</td>
<td>1</td>
<td>.032</td>
<td>4.901</td>
<td>.043</td>
</tr>
<tr>
<td>Group</td>
<td>.077</td>
<td>1</td>
<td>.077</td>
<td>11.768</td>
<td>.004</td>
</tr>
<tr>
<td>Error</td>
<td>.098</td>
<td>15</td>
<td>.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2.631</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: GHCMBP= Gaining Height of Centre of Mass at Backswing Phase

In Table 4, it is seen that the significant value of pre gaining height of centre of mass at backswing phase was .043, which was significant at 0.05 level of significant (P<0.05). So it can be concluded that initially there was significant difference in both the groups which might affect the main effect of the study. In that case, ANCOVA was the appropriate test for comparing these two groups. On the other hand, the main effect for the groups was significant (F=11.768, P=0.004, P<0.05) and it indicates that there was statistically significant differences between the groups after adjusting the effect of the pre-test.

Table 5
Tests of Between-Subjects Effects for Losing Height of Centre of Mass at Hitting Phase

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PreLHCMHP</td>
<td>.117</td>
<td>1</td>
<td>.117</td>
<td>9.274</td>
<td>.008</td>
</tr>
<tr>
<td>Group</td>
<td>.000</td>
<td>1</td>
<td>.000</td>
<td>.023</td>
<td>.881</td>
</tr>
<tr>
<td>Error</td>
<td>.189</td>
<td>15</td>
<td>.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.309</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Pre Losing Height of Centre of Mass at Hitting Phase

In the Table 5, it is seen that the significant value of pre losing height of centre of mass at hitting phase was .008, which was significant at 0.05 level of significant (P<0.05). So it can be concluded that initially there was significant difference in both the groups which might affect the main effect of the study. In that case, ANCOVA was the appropriate test for comparing these two groups. On the other hand, the main effect for the groups was not significant (F=.023, P=.881, P>0.05) and it indicates that there was statistically no significant differences between the groups after adjusting the effect of the pre-test.

DISCUSSION AND CONCLUSIONS

The six weeks training program was comprised of different plyometric exercises, strength exercises and smash specific drills and exercises. Plyometric and strength exercises mainly aimed to improve leg strength of the experimental group on the other hand the smash specific drill were practiced to improve smash technique. All the variables which showed significant improvement after six weeks training program were related to leg strength. They are:

- Height of centre of mass at backswing phase
- Height of centre of mass at hitting phase
- Gaining height of centre of mass at backswing phase

Hence the researcher can conclude that six weeks training program was sufficient to improve leg strength which can help badminton player to attain higher centre of mass during smash.

The following conclusions were drawn:

Height of centre of mass at backswing phase is highly dependent on the height of centre of mass at preparatory phase. More flexion of knee at preparatory phase helps to propel the body for more height at backswing phase. It means, the height of centre of mass at
preparatory phase is negatively correlated with the height of centre of mass at backswing phase. Most of the players gain their maximum height during backswing phase. Most of the players lose their maximum height at the moment of hitting the shuttle. Movement of arm from backswing to upward hitting position leads the players to lose their height of centre of mass. Hitting the shuttle from maximum possible height helps the players to get more downward angle while smash. Greater the angle of right elbow joint means more extension of elbow and more extension of elbow will generate greater force while hitting the shuttle.

REFERENCES

Aneja. O.P (2012)., “How To Play Badminton.” PrernaPrakashan; Delhi


Lee.E. B. et al. (2015)., “Training for speed, agility, and quickness.” Human kinetics; USA

Matveyev. I(1981)., “Fundamentals of sports training.” Progress publishers; Moscow

McGinnis. P.M. (2005)., “Biomechanics of sports and exercise.” Human kinetics; USA

Singh.A.B. (2012).”Sports training.” PrernaPrakashan; Delhi


Volker.B.B (2010).,“Badminton handbook.” Meyer & Meyer Sport; UK
SPORT MOTIVATION LEVEL OF UTTAR PRADESH U-19 AND RANJI MALE CRICKET TEAMS: A COMPARATIVE STUDY

Hem Chandra Joshi
Research scholar, Department of Sports Biomechanics, L.N.I.P.E., Gwalior, Madhya Pradesh (India)

R. S. Rajpurohit
Assistant professor, Department of advance training and coaching, Swarunim Gujarat Sports University, Gandhinagar, Gujarat (India)

Vishal Singh
Research Scholar, Indira Gandhi Institute of Physical Education and Sports Sciences, University of Delhi (India)

ABSTRACT
The aim of the study was to investigate and compare the sports motivation level among under-19 and ranji young male cricket players belonging the state of Uttar Pradesh. A total number of thirty \( N=30 \) professional male players consisting 15 players from each team (U-19 and Ranji) were taken as the subjects for the study. For collecting data, The Sport Motivation Scale (SMS-28) questionnaire was used as a test. Scoring was done according to the instructions given in the test manual of the checklist. Getting data to investigate the motivation level between both the teams were statistically analyzed by using two sample t-tests for the independent variables at 0.05 level of significance. The outcome of the study concluded that the U.P. under-19 cricket team was more internally motivated while playing the match as compare to the U.P. ranji cricket team. Whereas, there was only one factor (EM-Introjected) where the ranji cricket team was significantly more motivated than the under-19 cricket team during match.

Keywords: Motivation, Intrinsic Motivation, Extrinsic Motivation and Amotivation

INTRODUCTION
Historically, sociologically, politically, culturally and now medically, sport and physical activity has a long history of contributing to the overall evolution and positive growth of the human species (Bloom et al., 2005). Today's modern era of sports, psychological aspects of the player play a major role in training and giving high performance. Sport psychology, as the systematic scholarly study of human thought, emotion, and behavior in sport contexts, consists of four main areas: personality and sport participation, motivational processes, interpersonal and group processes, and intervention techniques to enhance sport performance and personal development (Cote and Thomas, 2007) and the role of a sport psychologist is to recognize how participation in sport exercise and physical activity enhances a person's development. The focus may be on behavior or on different psychological dimensions of human behavior, i.e. affective, cognitive, motivational or sensory-motor dimensions.

Motivation is at the heart of many of sport's most interesting problems, both as a developmental outcome of social environments such as competition and coaches' behaviors, and as a developmental influence on behavioral variables such as persistence, learning, and performance (Duda, 1989; Vallerand, et al., 1987. Several conceptual perspectives have been proposed to better understand athletes' motivation (Roberts, 1992). One perspective that has been found to be useful in this area points that behavior can be intrinsically...
motivated, extrinsically motivated, or amotivated (Deci, 1975; Deci & Ryan, 1985). This theoretical approach has generated a considerable amount of research and appears pertinent to the field of sports (Bribre et al., 1990; Deci & Ryan, 1985; Fortier et al. 1995; Vallerand et al., 1987). In general, intrinsic motivation (IM) refers to engaging in an activity purely for the pleasure and satisfaction derived from doing the activity (Deci, 1975). Extrinsic motivation (EM) pertains to a wide variety of behaviors that are engaged in as a means to an end and not for their own sake (Deci, 1975). Amotivation is not to perceive contingencies between their actions and the outcomes of their actions.

Cricket is a wonderful world that creates learning situations in which the participants learn and modify certain qualities in a unique manner and motivation is directly linked with success in sports specially in longs durational sports such as cricket, hockey, football, long distance running and so more because the athlete has to sustain his/her performance for the longer duration of time and for that he or she has to keep motivating himself or herself instinctly at the end of the match. So, the present study hereby makes an effort to broaden the horizon of knowledge by investigating the comparison in various sports motivational variables (factors) of professional cricket players at different level of competitions.

METHODS

For fulfilling the purpose of the study, a total number of thirty [N=30] male professional cricketers were purposely selected from two different teams of Utter Pradesh as the subjects for the study in which one team was under-19 cricket team and another was ranji cricket team consist of fifteen [N=15] players in each teams. The mean age of under-19 and Ranji both the teams were 17.47±1.06 and 31.40±2.53 respectively.

The measuring instruments used for the study were the Sport Motivation Scale (SMS-28) (Pelletier et al., 1995). There were 28 items in the Sport Motivation Scale (SMS-28) which tested three factors of motivation namely, intrinsic motivation, extrinsic motivation and amotivation. The described factors are as follow:

1. 2, 4, 23, 27 Intrinsic motivation - to know
2. 8, 12, 15, 20 Intrinsic motivation - to accomplish
3. 1, 13, 18, 25 Intrinsic motivation - to experience stimulation
4. 7, 11, 17, 24 Extrinsic motivation - identified
5. 9, 14, 21, 26 Extrinsic motivation - introjected
6. 6, 10, 16, 22 Extrinsic motivation - external regulation
7. 3, 5, 19, 28 Amotivation

The data was collected of under-19 U.P team during match between U.P. and Haryana in the month of December 2015 at Victoria Park situated in Meerut (U.P.). On the other hand, the data was collected of U.P. Ranji team in the month of October 2015 during the match of U.P. and railways at Nehru stadium, Ghaziabad. Sport Motivation Scale (SMS-28) Test was administered to assess their motivation level. Statistical analysis was done with SPSS (Statistical Package for the Social Sciences, 20.0, USA). Mean and standard deviation was calculated as a descriptive statistics and two samples independent t-test was used if the mean change in scores was significant. Then obtained “t” value was tested at 0.05 level of significance. The assumptions for applying samples independent t-test (parametric data characteristics and equality of variance) were also taken into consideration before applying the test.

RESULTS

For know the distribution of data, normality test was employed with the help of SPSS. The output of normality test is given below in table 1:
Table 1 display the outcome of shapiro-Wilk test (Normality test) for distribution of the data. As the results show that the test sig. value of Shapiro-Wilk Test is more than the level of significance (P > 0.05) in case of all the sports motivational factors except the distribution of amotivation (Assumption Violated; p < 0.05). So it can be justify that the data follows the normal distribution and using parametric test (Independent t-test) was the appropriate test for further analysis of data.

The descriptive statistics as well as the result of independent t- test which was applied in order ascertains the difference between under-19 and ranji U.P. cricket team on sports motivation level have been presented table 2:

Table 2 shows the descriptive outcome (M±SD) and the comparative outcome (t value) of all sports motivation related factors of professionals U.P. male cricketers and the results revealed that the U.P. under-19 cricket team was more internally motivated while playing the match to the U.P. ranji cricket team as the result showed the significant difference (P < .05) in two intrinsic motivation factors [To know (t = 3.27; p = .003) and To accomplished (t = 3.38; p = .002)] out of three. The study indicates that intrinsic motivation constituted the major part of motivation in young cricketers because of their strong will to achieve more and reach at top level at young age On the other hand, only one extrinsic motivation factor [Introjected (t = 2.09; p = .046)] showed the significant difference (p > .05) rest all other motivation related factors (IM to Experience Stimulation, EM - identified, EM - External Regulation and Amotivation) showed the insignificant difference (p > .05) in case of U.P. Under-19 and Ranji cricket team. The outcome of the descriptive statistics is also graphically represented below in figure 1:

![Figure 1: Mean Difference in Various Factors of SPS-28 between Selected Teams](image)

DISCUSSION AND CONCLUSIONS

The U.P. under-19 cricket team was more internally motivated while playing the match as compare to the U.P. ranji cricket team. Whereas, there was only one factor (EM-Introjected) where the ranji cricket team was
significantly more motivated than the under-19 cricket team during match otherwise both the team were equally motivated by other external interventions. So it can be assumed that intrinsic motivation constituted the major part of motivation in under-19 young cricket team because of their strong will to achieve more and reach at top level at young age and the similar study can be undertaken on larger sample for more comprehensive results and better generalizations.

REFERENCES


ABSTRACT

The purpose of the study was to compare the personality traits of sports and non-sports women at college level. The present study was conducted on the 30 sports and 30 non-sports women of Pune City. On the basis of evidence available in the literature and with personal experience as well as discussion with experts the following hypothesis was formulated what there would be significant difference in personality traits of sports and non-sports women at college level. The personality questionnaire developed by H.J.Eysenck in national psychological corporation was selected for the collection of data because it was found to be most reliable and have been very often used in research in the profession physical education and sports. In order to determine the personality traits of sports and non-sports women independent 't' was employed and the level of significance was set (0.05). It is observe that, calculated 't' value is 6.808 s greater than the tabulated t-value of 2.002, hence there is significant difference was found between the personality trait of selected sports and non-sports women.

Keywords: Sports and non-sports women, personality traits.

INTRODUCTION

There are certain psychological principles which have to be applied so that the athlete and players are able to show their best in their performance. It is important to know about the role of emotional phenomenon like personality, emotional intelligence, mental toughness and motivation of the players during the training as well as competitive situations (Bull, 1991)

Most of the sports psychologist are in view that the sports psychology examine the behavior and also the psychology of motor learning.

Psychology is also in reference to the usage and application of skill, knowledge and understanding various activities undertaken by humans and how they are used through daily activities, whether that is within events, talking to people, education and employment, relationships and even treating mental health issues.

The research studies conducted on different human or people from different occupation revealed that your personality is very much influence from the surrounding where you work or live. In nut shell your personality reflects the person from where you usually belong. (Caitlin Moscatello 2015)

METHODS

For the purpose of comparing the personality trait researcher had selected 30 Sports women and 30 Non-sports women (total sixty) subjects. All the subjects were students of different college of Pune city. The subject's age group was ranged from 19 to 22 years. To assess the personality traits of selected subject's researchers had used H.J.Eysenck constructed questionnaire which was considered as appropriate and precise for this study. Descriptive statistical technique was used to find out the scattering of the score. Independent “t” test was used to find out the significant difference between sports and non sports girls.
RESULTS

Table-1  
Descriptive Statistical Analysis of  
Selected Psychological Variable on  
Sports and Non Sports Women

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports women</td>
<td>30</td>
<td>34.2667</td>
<td>3.01</td>
<td>0.503</td>
</tr>
<tr>
<td>Non sports women</td>
<td>30</td>
<td>29.8667</td>
<td>4.01</td>
<td>0.601</td>
</tr>
</tbody>
</table>

Table-1- shows that, data collected on 30 sports women the mean was 34.266, std deviation was 3.01 and std error mean was 0.503. For 30 non sports women the mean was 29.866, std deviation was 4.01 and std error mean was 0.601.

Table-2  
Significance mean Difference between  
Sport Women And Non Sports Women  
on Psychological Variables

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean difference</th>
<th>Standard deviation</th>
<th>t value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports Women</td>
<td>4.4</td>
<td>3.01</td>
<td>6.81</td>
<td>0.00</td>
</tr>
<tr>
<td>Non Sports Women</td>
<td>4.01</td>
<td>4.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The calculated 't' values was 6.81 which is significant as the significant value was P>0.05. (2.0017)

Hence, concluded here there were difference was found on the psychological traits between the 30 non sport women and 30 sport women s.

DISCUSSION AND CONCLUSIONS

This study was an endeavor in similar way to find out and compare the diversity among the two different field’s women in terms of personality trait. In this aspect the researcher had selected 30 sports women from sports field and 30 non-sports women from non sports field.

In the light of the results of analysis researcher found that there were significant difference was observed between the girls of sports participants and non participant in terms of personality traits. As studies shows that you're surrounding specially where you work having more influence on your personality. This dispersion because of demand of the nature of works which make you to react differs from individual to individual.

Here, also one group of girls are regularly participating in sports activities and sports involvement bring changes in the human behavior in terms of personality. Sports participation requires a person to be self confidence, more cooperative, develop leadership quality and enhance decision making quality, help to adjust in all the aspect of life etc. (Benjamin P. Chapman, 2008)

Therefore, researcher felt these all above factors might be reasons to bring the significant difference between the sports women from sports participation and non sports women who are not involved in any sports activities.

REFERENCES

Eysenck, H., J., (1982). Sport and personality Advances in Behaviour Research and Therapy Volume 4, Issue 1,


EFFECTS OF PLYOMETRIC TRAINING AND RESISTANCE TRAINING ON AGILITY OF TENNIS PLAYERS

Dr. Madan Singh Rathore
Assistant Professor, LNIPE, Gwalior

ABSTRACT
The purpose of the study was to find out the effects of Plyometric Training and Resistance Training on Agility of Tennis Players. For the purpose of the study 60 male Tennis players of Gwalior, who had participated in various tournaments in Tennis at the national, inter-varsity, or state level were selected. Their age ranged from 18-23 years. Agility was selected as a dependent variable and plyometric training and resistance training was considered as Independent Variables. For the study pre test-post test randomized group design comprising of two experimental groups (n=20 in each group) namely plyometric training group (PT) and resistance training group (RT) and one active control group (n=20) were adopted. To test the Agility of Tennis players, Illinois Agility Test was used. To compare the effects of plyometric training and resistance training on agility of Tennis players, Analysis of co-variance (ANCOVA) was used. The level of significance was set at 0.05. The result reveals that there was significant effect of the plyometric training programme on agility of Tennis players but no significant effect was found by resistance training programme. Based on the findings and within the limitation of the study it was noticed that plyometric training help to improve agility of Tennis players since the agility performance of the subjects of experimental groups were found statistically significant.

Key Words : Plyometric training, Resistance training, Agility.

INTRODUCTION
To improve and refine a player's Tennis skills which are crucial for enhancing the quality of play, it is essential to improve the athletic skills that allow him to elevate his play to a higher level. Athletic skills include variables such as speed, power, endurance, agility, coordination, balance and reaction time that contribute to the total development of the player. The level at which Tennis skills are performed is directly related to the level of the athlete's total conditioning (Brittenham G., 1996).

Plyometric is a rapid pre stretching of a muscle during an eccentric action, followed immediately by a concentric action of same muscle and connective tissue. This system involves stretch-shortening cycle of the muscle. It is a form of exercise which links strength with speed of movement. Plyometric or reactive jumps are known to be effective for development of explosive strength. Resistance training involves exercise programme that causes the muscles to contract against an external resistance with the expectation of increasing strength, tone, mass, and endurance. Agility is now considered a multidimensional component that involves balance, coordination, speed, reflexes, strength, endurance, acceleration ability and deceleration ability.

Agility is the ability to change the body's position, and requires a combination of balance, coordination, speed, reflexes, and strength. Agility is usually achieved when a person is using his ATP-PC or lactic acid (anaerobic) systems. It is described in terms of response to an opposing player, moving target, as seen in field sports and racket sports. It is a rapid whole body movement with change of velocity or direction in response to a stimulus. The basic need of a Tennis player in the competitive world is the ability to rapidly switch between forward, backward, lateral and vertical movements. To enhance such movement qualities in Tennis, high levels of power, strength, endurance, flexibility and agility are required to achieve the goal. Undoubtedly, such components are inter-dependent and as such may be developed through common training regimen.

Thus, it was thought reasonable to investigate whether, and if so, how much plyometric training and resistance training can improve agility of Tennis players.
METHODS

Sixty male Tennis players from Gwalior, ranging the age between 18-23 years who had participated in various Tennis tournaments at the national, inter-varsity or state level, were selected as the subjects of the study. Agility was selected as a dependent variable and plyometric training and resistance training were considered as independent variables. To test the agility, Illinois Agility Test was used and measured in seconds. The pre test- post test randomized group design which consisted of two experimental groups (n=20 in each group) namely plyometric training group (PT) and resistance training group (RT) and one active control group (AC) was used in the study.

The treatment was administered on both the experimental groups for three days a week (45 min/day) for the period of eight weeks while the active control group underwent traditional practice of Tennis. The plyometric training group was given training using equipment like ladder, mini hurdles, cones etc. and resistance training group was given resistance exercises with the use of elastic bands, weight training equipments and partner’s body weight. Before the administration of training schedule, pre test data on agility was collected from both the experimental groups and active control group. Similarly after the completion of eight weeks post training data of all the groups were collected.

To find out the effects of plyometric training and resistance training on agility of Tennis players, Analysis of Co-Variance (ANCOVA) was used. The LSD post hoc test was used to find out the paired mean difference. The level of significance was set at 0.05.

RESULTS

Findings: The findings pertaining to the study are presented in Tables 1 and 2.

Table No. 1 depicts the descriptive statistics on agility of the two experimental groups and one active control group.

**TABLE-2**

<table>
<thead>
<tr>
<th></th>
<th>PT Means</th>
<th>RT Means</th>
<th>AC Means</th>
<th>Sum of Square</th>
<th>Dr</th>
<th>Mean</th>
<th>Sum of Square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test</td>
<td>18.706</td>
<td>18.269</td>
<td>18.554</td>
<td>A 1.973</td>
<td>2</td>
<td>0.986</td>
<td></td>
<td>2.087</td>
</tr>
<tr>
<td>W 26.937</td>
<td></td>
<td></td>
<td></td>
<td>0.472</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Test</td>
<td>16.583</td>
<td>16.772</td>
<td>17.134</td>
<td>A 3.129</td>
<td>2</td>
<td>1.564</td>
<td></td>
<td>3.700*</td>
</tr>
<tr>
<td>W 24.106</td>
<td></td>
<td></td>
<td></td>
<td>0.422</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted Post Test</td>
<td>16.514</td>
<td>16.857</td>
<td>17.118</td>
<td>A 3.627</td>
<td>2</td>
<td>1.813</td>
<td></td>
<td>4.979*</td>
</tr>
<tr>
<td>W 20.765</td>
<td></td>
<td></td>
<td></td>
<td>0.364</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant, F₁₀.₀₅ (2,57), F₂₀.₀₅ (2,56)

Table 2 revealed no significant difference in agility in pre test phase among PT group, RT group and AC group. The obtained 'F' value 2.087 was found lesser than the tabulated 'F' value 3.15 at 0.05 level of significant with 2, 57 degree of freedom.

However, the 'F' ratio values in post test phase (3.700), and adjusted post-test phase (4.979) were found significant for being greater than the tabulated 'F' values 3.15 and 3.16 at 0.05 level of significant with 2, 57 and 2, 56 degree of freedom respectively. As in analysis of co-variance the significant improvement in agility in adjusted post-test means among PT group, RT group and AC group were found, further in order to find out the significant difference among the paired adjusted final means, the post-hoc test were computed, which is presented in table 3.

**TABLE-3**

Paired means among the two experimental groups and one active control group on agility (Seconds)

<table>
<thead>
<tr>
<th>PT</th>
<th>RT</th>
<th>AC</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.514</td>
<td>16.857</td>
<td>0.343</td>
<td></td>
</tr>
<tr>
<td>16.514</td>
<td>17.118</td>
<td>0.604*</td>
<td></td>
</tr>
<tr>
<td>16.857</td>
<td>17.118</td>
<td>0.261</td>
<td></td>
</tr>
</tbody>
</table>

*Significant, CD₁₀.₀₅ = 0.381 The Table 3, (post-hoc test) in respect to the paired adjusted final mean differences in agility clearly indicates significant difference between PT group and AC group (0.604), which was found greater than that of the critical value 0.381.
However, no significant difference between RT group and AC group (0.261) and PT group and RT group (0.343) were observed in the difference of mean values which were found lesser than that of the critical value (0.381). The graphical representation of analysis is presented in Fig.1.

![Graphical representation of analysis](image)

**Fig.1 : Graphical representation of agility between pre and post test means among the three groups**

**DISCUSSION AND CONCLUSIONS**

As the result reveals significant improvement in Experimental groups in comparison to the Active Control group in selected variable of agility, it may be attributed to the fact that the plyometric training and resistance training were effective in developing agility of Tennis players. However, no significant difference was noticed between two experimental groups i.e. plyometric and resistance training groups in improving agility.

The result of developing agility by plyometric exercises might be due to the fact that the phenomenon of the stretch-shortening cycle (SSC) and is especially prevalent in intermittent game like Tennis. SSC actions exploit the myotatic reflex as well as the elastic qualities of tendons and muscle, and the resulting performance is independent of maximum strength in players. Plyometric drills involved stopping, starting, and changing directions in an explosive manner. These movements were components that could assist in developing agility.

Besides, the improvement of agility of Tennis players is not significant by resistance training was observed probably due to the stiffness of muscles, ligaments and tendons that may reduce its elasticity. The result is supported by the study of Faigenbaum et al (2007) who studied on the effects of a short-term plyometric and resistance training program on fitness performance in boys age 12 to 15 years and they concluded that The plyometric training group made significantly (p < 0.05) greater improvements than resistance training in long jump (10.8 cm vs. 2.2 cm), medicine ball toss (39.1 cm vs. 17.7 cm) and pro agility shuttle run time (-0.23 sec vs. -0.02 sec) following training.

The results showed that except for agility, both resistance training types led to change in lower-body explosive power, lower-body muscle endurance, running speed, maximum lower-body strength, and abdominal muscle endurance. Within the limitations of the study, it may reasonably be concluded that plyometric training is effective in significantly improving agility of Tennis players whereas resistance training does not significantly improve it.

**REFERENCES**


EFFECT OF SIX WEEKS DYNAMIC EFFORT LIFTING WITH HEAVY TRAINING PROGRAM IN IMPROVEMENT OF BENCH PRESS PERFORMANCE OF POWERLIFTING

Mr. Mukesh Narwariya
Assistant professor, LNIPE (Gwalior)

Mr. Bhargab Borah
Assistant professor, LNIPE (Gwalior)

ABSTRACT

The purpose of this study was to examine the effect of six weeks dynamic effort lifting with heavy training program for improving performance of bench press in powerlifting. It was an experimental study in which pre-test & post-test randomized groups design was used. 30 male weight lifters age ranging between (22±2) were selected as sample by using simple random sampling technique (N=30) from Madhya Pradesh through the simple random technique as sample. (N=30) They were equally divided into, Experimental group (N=15) and Control group (N=15). Maximum Strength 1RM Bench press test was conducted on both the groups. Result shows that data collected was analyzed by using Descriptive Statistics to see the change of dynamic effort lifting with heavy training program was useful to improve bench press performance. Further data was analyzed by using ANCOVA, the mean score of experimental group of Bench press is M=90.47 and control group is M=85.33, F value is 69.67 which shows the significant difference at 0.05 level, thus researcher concludes that there was improvement of performance 1RM Bench press of Experimental group as compared to control group due to the treatment given.

Keyword: Dynamic effort lifting with heavy training program, 1RM Bench press.

INTRODUCTION

Powerlifting requires specialized training techniques that are focused on strength and explosive power. Traditional training methods dictated low repetitions with maximal weight. These practices are still true today, however training methods have advanced to include emphasis on explosive power. This may be achieved dynamic exercises which utilize lighter weight and alternating repetition patterns. The squat bench press and dead lift are the three main lifts in competition. Dynamic effort lifting with heavy training is basically modified version of the upper and lower body. In power lifting each training trained the entire body in two days which allows for four workouts per week. This type of workout buildup the muscle power of lifter and related to power lifting. Muscles get workout by max & dynamic effort training program through to improvement in the power lifting performance of lifter.(Jim Stoppani 2008 Encyclopedia of Muscle & Strength). The purpose of this study is to see the effect of six weeks dynamic effort lifting with heavy training program in improvement of bench press performance in power lifting.

METHODS

The design for this study was pre-test post-test random group design. The statistical population was all the male powerlifters. Total no of lifters were 30 (N=30). The participants were randomly assigned into two groups. (Group 1)Experimental group (N=15) and (group 2) Control group (N=15). To measure the pre and post data standard 1RM bench press test was used 1RM=(weight lifted)/[1.0278-(repetitions x 0.0278)]. Both the group were (experimental & control group) had regularly received their
daily training program but along with that the experimental group was received dynamic effort lifting with heavy training for 30 minutes 3days in a week for 6 weeks.

Before taking pre test 10 minute warm up was given to both group. Six week and dynamic effort lifting with heavy training program was administered on the experimental group to follow FITT formula was used & progression of exercise load was increased in every week as per subject’s adaptation, and control group was doing their regular workout. To study the effect of training on improving the performance descriptive statistics (Mean & SD) were employed. While ANCOVA statistical technique was used to determine the significant difference between the groups.

RESULTS

In order to find out the effect of training, ANCOVA was calculated. The level of significance was set at 0.05. The descriptive statistics are presented in table-1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>90.4667</td>
<td>4.80872</td>
<td>15</td>
</tr>
<tr>
<td>Control Group</td>
<td>85.2333</td>
<td>4.49153</td>
<td>15</td>
</tr>
</tbody>
</table>

Table-1 shows the mean and standard deviation of different treatment groups during post testing.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bench press pre treatment Group</td>
<td>560.308</td>
<td>1</td>
<td>560.308</td>
<td>329.891</td>
<td>.000</td>
<td>.924</td>
</tr>
<tr>
<td>Error</td>
<td>118.327</td>
<td>1</td>
<td>118.327</td>
<td>69.667</td>
<td>.000</td>
<td>.721</td>
</tr>
<tr>
<td>Corrected Total</td>
<td>678.635</td>
<td>27</td>
<td>25.306</td>
<td>69.667</td>
<td>.000</td>
<td>.721</td>
</tr>
</tbody>
</table>

The table-2 reveals the final results of ANCOVA. Table also shows the F-value for comparing the adjusted means of the treatment group during post testing. Since p-value for the F-statistics is 0.000 which is less than 0.05, it is significant.

The effect of training and results in different groups are also applied in figures, and it is shown graphically in Fig. 1.

DISCUSSION AND CONCLUSIONS

Many attempts have been made to determine which training is more effective, lifting maximal weight or intermediate weights. The ideal type of training to increase a muscle’s cross sectional area is different from ideal type of training to increase neuromuscular efficiency, dynamic effort lifting with heavy training is one of them. As dynamic effort lifting is defined as lifting a non-maximal load with the greatest speed possible, we can work on our motor recruitment efficiency by generating force quickly and explosively, requiring a co-ordinate and simultaneous recruitment of high numbers of motor units.

On the basis of the result obtained in the study the researcher made the conclusion that the six weeks dynamic effort with heavy training program has significant effect on maximum strength of improvement of power lifter performance in bench press. From the finding of the study further conclusion was made after treatment to the experimental group it was observed that there was improvement of performance in 1RM Bench press of Experimental group in comparison to Control group due to the treatment given to it which was significant.

REFERENCES


A STUDY ON PHYSIOLOGICAL PROFILE OF INTER UNIVERSITY SQUASH PLAYERS

Neeraj Singh
Asst. Prof. LNIPE GWALIOR

ABSTRACT
The purpose of this study was to evaluate the physiological profile of four best squash teams of the inter university level. The data was collected from the all India inter university tournament held at lakshmibai national university of physical education, Gwalior. A total of 24 professional male squash players of inter university level from university of Mumbai, Chandigarh, Delhi and Pune University were selected as the subjects for the study. Subjects were tested for vital capacity, systolic blood pressure, diastolic blood pressure, pulse rate, positive breath holding capacity, negative breath holding capacity and peak flow rate. Results showed that the mean and standard deviation of vital capacity, systolic blood pressure, diastolic blood pressure, pulse rate, positive breath holding capacity, negative breath holding capacity, and peak flow rate were 3.57, 136.54, 84.12, 67.95, 34.41, 21.38 and 528.75 respectively. The test data obtained from this study provided a good baseline and reference for the individual players tested the coaches of the interuniversity, as well as future elite players and coaches. It also enabled strengths and weaknesses within the group to be identified, so that appropriate training programmes could be designed to improve their performance.

Keywords : Vital Capacity, Squash, Peak Flow Rate

INTRODUCTION
Squash at the elite level is primarily aerobic in nature, with intermittent bursts of activity being supplied from anaerobic energy sources.' 2'the champion needs both wide range of skills and a high standard of fitness. Essentially squash fitness calls for stamina, strength, and physical agility besides the demand of high technical skill, good match temperament, and mental agility.3Despite the growing popularity of squash, with increasing numbers of International Squash Racquets Federation (ISRF) members (from 67 to 100 in 1992), and a possible bid for participation in the Olympic Games for the year 2000, 4 studies of physiological characteristics of elite squash players are scarce."

Junior players are required to have a good stroke production and physical fitness, as well as physiological characteristics that will enable successful performance at the competitive level. The sport-specific technical skills in racket sports are predominant factors. The physical fitness of a player however, can be a decisive determinant of success during a tournament (Smekal et al., 2001). This coincides with Groppel and Roetert (1992) who reported that the physical requirements of racquet sports demanded efficiency in a number of fitness components. A racquet sport player would need to develop higher levels of the basic physical qualities to be able to compete effectively against stronger opponents (Groppel and Roetert, 1992).

Hence, the present study was undertaken to evaluate the physiological profile of the squash players.

METHODS
A total of 24 professional male squash players of inter university level from university of
Mumbai, Chandigarh, Delhi and Pune University were selected as the subjects for the study. All participants were informed verbally and in writing about the nature and demands of the study. They were informed that they could withdraw from the study at any time, even after giving their written consent. In the overall study all the subjects were informed prior to taking the data. The entire subjects reported at 7 am in the examination area. They were fully relaxed; no motivational techniques were given to the subjects. The vital capacity is assessed through dry spirometer attaching clean mouth piece by inhaling followed by deep forceful expiration. Systolic & diastolic pressure is calculated through digital sphygmomanometer by placing blood pressure cuff around the arm. Systolic measurement indicates arterial pressure, where diastolic indicates arterial pressure between beats. In peak flow meter, marker is moved to the bottom of the scale and blow as hard as possible in single blow. Positive and negative breath holding was measured manually by holding the breath for maximum time (inhalation + ve) and (exhalation - ve). Descriptive statistics (means and standard deviation) were used to describe the physiological variable of inter-university squash players.

RESULTS

Table 1
Descriptive Statistics

<table>
<thead>
<tr>
<th>Physiological Variables</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capacity</td>
<td>2.50</td>
<td>4.10</td>
<td>3.57</td>
<td>.40</td>
</tr>
<tr>
<td>Systolic Blood Pressure</td>
<td>117.00</td>
<td>174.00</td>
<td>136.54</td>
<td>12.63</td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>67.00</td>
<td>119.00</td>
<td>84.12</td>
<td>11.67</td>
</tr>
<tr>
<td>Pulse Rate</td>
<td>59.00</td>
<td>78.00</td>
<td>67.95</td>
<td>5.44</td>
</tr>
<tr>
<td>Positive Breath Holding Capacity</td>
<td>24.00</td>
<td>57.00</td>
<td>34.41</td>
<td>9.91</td>
</tr>
<tr>
<td>Negative Breath Holding Capacity</td>
<td>14.00</td>
<td>37.00</td>
<td>21.38</td>
<td>7.09</td>
</tr>
<tr>
<td>Peak Flow Rate</td>
<td>430.00</td>
<td>650.00</td>
<td>528.75</td>
<td>58.63</td>
</tr>
</tbody>
</table>

Table 1 reveals the mean and standard deviation of vital capacity was 3.57± .40, systolic blood pressure was136.54± 12.63, diastolic blood pressure was 84.12±11.67, pulse rate was 67.95±5.44, positive breath holding capacity was 34.41± 9.91, negative breath holding capacity was 21.38± 7.09 and peak flow rate was 528.75± 58.63 respectively. The graphical representation of Mean values of all the selected variables are shown in Figure-1.

DISCUSSION AND CONCLUSIONS

The physiological demand of squash players can be decisive determinant of success during a tournament, and if a player wishes to achieve success in inter university competition, improvements in physiological needs to be emphasised.

The test data obtained from this study provided a good baseline and reference for the individual players tested the coaches of the interuniversity, as well as future elite players and coaches. It also enabled strengths and weaknesses within the group to be identified, so that appropriate training programmes could be designed to improve their performance.
REFERENCES

Clark, Harrison H., Physical Fitness Research Digest 2:4, (1972) Washington president council on Physical Fitness and Sports,


Pare house, Lawrance E. and Miller, Augustus T (1963)., Physiology of Exercise St. Louis: The C.V. Mosby Company,

Ross, J. S. and Wilson, K. S. (1973), Foundation of Anatomy and Physiology, The English Book Society, Churchhill Living Store.,

AN INVESTIGATION OF BIO-MOTOR ABILITIES DEVELOPMENT PATTERN OF TRAINED INDIAN GIRLS: A CROSS SECTIONAL STUDY

Dr. S. C. Negi
Chief Football Coach, NSNIS, Patiala, Punjab (India)

Hem Chandra Joshi
Research Scholar, Department of Sports Biomechanics, L.N.I.P.E., Gwalior (India)

ABSTRACT
Motor fitness is a present aptitude for physical skills, includes strength and co-ordination enriches today’s Manpower in players performance. So, the aim of the study was to investigate and cross sectional wise compare the developmental pattern of selected bio-motor abilities of trained Indian female athletes of 10-16 years of age. For the purpose of the study total 752 girls from different games and sports (trained) and from different part of India falling in the age range of 10-16 years. The Six components of bio-motor components namely Explosive Leg Strength, Abdominal Strength, Trunk Flexibility, Speed, Agility and Endurance were assessed using standard techniques. The developmental pattern investigated by the present study indicated the positive progressive improvement in case of all selected bio-motor components up to 14 years except trunk flexibility (up to 13 years.) and after, the trend seemed to be slow or stagnated or deteriorated.

Key Words: Motor development pattern, Strength, Flexibility, Speed, Agility, Endurance, Trained

INTRODUCTION
Training is an essential part of preparing for sports competition. If training for any competitive sport is to be effective it must related to the demands of the game. Fitness for the sport assumes that the player is capable of meeting these demands; otherwise, he or she may not be able to cope with the physical and physiological stress of match-play. In this instance, the player has to raise fitness levels or risk not being selected. (Thomas, 2005).

However, the word physical fitness and motor fitness are often used interchangeably. The term motor fitness was developed as describe a broad concept than physical fitness. This extensive term defined by Barrow (1964) as "the present acquired and innate to perform motor skills of a general and fundamental nature, exclusive of highly specialized sports and gymnastic techniques". A Comparative Study of Motor Performance Level 409 skills efficiently and effectively. Power, balance, agility, speed, reaction time and kinesthetic perception are the traits of motor performance, and these traits plays major role in enhancing the performance of any game's skills. With a good and well efficient combination of all these motor performance traits a player can give all his/her utmost throughout the most strenuous of competitive matches. (Singh, 2010).

The growth and development of motor abilities and their accurate assessment definitely helps in identifying the talented children and also in formulating scientific training programme for the children and youth of various ages, so that it leads to the achievement of high performance at the right age and also to minimize any negative effect of training on them. Espenschade (1968) observed through his study that the general motor ability of girls did not improve after the
age of 14, whereas, body shows steady improvement up to 18 year of age. Other study did by Morehouse and Miller (1968) concluded that the athletic ability in girls reached a maximum at the age of 13 or 14 years then tended to decline up to 18 years of age. Berry (1974) concluded in his study that the power performance of girls improves up to the 13 years. Anyanwu (1977) and Bennett et al. (1983) concluded in their studies that trained girls possess better fitness levels at every age in comparison to untrained girls. Therefore, there is a need to study the motor development patterns of trained Indian girls of 10-16 years of age, so that their rate of development is properly utilized to improve sports performance in different games and sports.

**METHODS**

The methodology of the study consist of selection of subjects, selection of variables, selection of tests used to assess the bio-motor components, testing procedure and the statistical technique employed for analysis of data.

For fulfilling the purpose of the study, a cross sectional samples of total seven hundred and fifty two [N= 752] trained girls of 10-16 years was randomly selected from various sports promotion schemes of Sports Authority of India, Sports Schools, Sports Hostels, Sports Wing, Regional and District Coaching Centres, Sub-junior and Junior National Coaching Camps.

Various components of bio-motor ability were measured using standard test as mentioned in table-1.

Prior to data collection field marking was done. All subjects were asked to go for warm-up. The tests for all selected motor components i.e. Explosive Leg Strength, Abdominal Strength, Trunk Flexibility, Speed, Agility and Endurance were properly demonstrated and instruction to complete the test was given to the subjects. When subjects were ready for the test, the data was recorded after administering the tests.

Mean and standard deviation was calculated as a descriptive statistics and one way analysis of variance (ANOVA) test was used if the mean change in scores was significant. Then obtained “t” value was tested at 0.05 level of significance. The assumptions for applying one way analysis of variance (ANOVA) test (parametric data characteristics and equality of variance) was also taken into consideration before applying the test.

**RESULTS**

The descriptive statistics as well as the result of one way analysis of variance (one way ANOVA) which was applied in order ascertains the motor components development pattern have been presented below:

The motor development pattern was presented in the descriptive statistics given below in table 2:
Table 2
Descriptive Statistics [Mean (M) ± Standard Deviation (S.D.)] of 10 to 16 Years old Trained Girls

<table>
<thead>
<tr>
<th>Components</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M ± S.D)</td>
<td>(M ± S.D)</td>
<td>(M ± S.D)</td>
<td>(M ± S.D)</td>
<td>(M ± S.D)</td>
<td>(M ± S.D)</td>
<td>(M ± S.D)</td>
</tr>
<tr>
<td>Explosive Strength</td>
<td>176.46±7.07</td>
<td>185.07±9.33</td>
<td>192.75±10.99</td>
<td>193.65±10.33</td>
<td>196.72±13.6</td>
<td>193.03±10.23</td>
<td>191.47±10.27</td>
</tr>
<tr>
<td>Abdominal Strength</td>
<td>36.47±6.12</td>
<td>37.85±6.21</td>
<td>40.67±5.97</td>
<td>42.57±6.73</td>
<td>42.49±6.11</td>
<td>42.42±7.32</td>
<td>42.05±6.78</td>
</tr>
<tr>
<td>Speed</td>
<td>7.04±0.31</td>
<td>6.78±0.26</td>
<td>6.63±0.34</td>
<td>6.64±0.30</td>
<td>6.61±0.28</td>
<td>6.61±0.24</td>
<td>6.67±0.26</td>
</tr>
<tr>
<td>Agility</td>
<td>17.02±0.30</td>
<td>16.71±0.41</td>
<td>16.61±0.42</td>
<td>16.57±0.40</td>
<td>16.54±0.43</td>
<td>16.52±0.41</td>
<td>16.60±0.37</td>
</tr>
<tr>
<td>Endurance</td>
<td>198.63±9.80</td>
<td>190.48±12.80</td>
<td>183.84±13.79</td>
<td>184.96±14.91</td>
<td>182.38±14.48</td>
<td>186.33±15.70</td>
<td>185.69±18.21</td>
</tr>
</tbody>
</table>

The data pertaining to each selected motor development components across 10 to 16 years of trained girls were analyzed by using F-ratio (one way ANOVA) and have been presented in table 3:

Table 3
Comparative Results of Selected Motor Components of Trained Girls of 10 to 16 Years old

<table>
<thead>
<tr>
<th>Component</th>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MSS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive</td>
<td>Between</td>
<td>24347.68</td>
<td>6</td>
<td>4058.0</td>
<td>38.59*</td>
</tr>
<tr>
<td>Strength</td>
<td>Within</td>
<td>78334.47</td>
<td>745</td>
<td>105.15</td>
<td></td>
</tr>
<tr>
<td>Abdominal</td>
<td>Between</td>
<td>27227.20</td>
<td>6</td>
<td>4537.86</td>
<td>105.14*</td>
</tr>
<tr>
<td>Strength</td>
<td>Within</td>
<td>32158.68</td>
<td>745</td>
<td>43.16</td>
<td></td>
</tr>
<tr>
<td>Trunk</td>
<td>Between</td>
<td>1180.57</td>
<td>6</td>
<td>196.76</td>
<td>12.29*</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Within</td>
<td>11932.25</td>
<td>745</td>
<td>16.01</td>
<td></td>
</tr>
<tr>
<td>Speed</td>
<td>Between</td>
<td>12.279</td>
<td>6</td>
<td>2.046</td>
<td>24.07*</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>63.068</td>
<td>745</td>
<td>0.085</td>
<td></td>
</tr>
<tr>
<td>Agility</td>
<td>Between</td>
<td>15.17</td>
<td>6</td>
<td>2.53</td>
<td>16.43*</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>114.76</td>
<td>745</td>
<td>0.154</td>
<td></td>
</tr>
<tr>
<td>Endurance</td>
<td>Between</td>
<td>125052.72</td>
<td>6</td>
<td>20.842</td>
<td>90.42*</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>171718.17</td>
<td>745</td>
<td>230.49</td>
<td></td>
</tr>
</tbody>
</table>

* Significant, F_{0.05} (6,745) = 9.422

Table 3 showed the significant difference in all selected bio-motor components of 10 to 16 year old trained girls and the results showed the significant difference in all selected bio-motor components among trained girls across the period of time. As per the F- ratio for all the selected motor components were significant.

DISCUSSION AND CONCLUSIONS

The descriptive results compiled that there was a continuous improvement in leg strength and abdominal strength up to 14 years and then some kind of deterioration or stagnation has been observed in girls at the age of 15 and 16 years. This might be because of the fact that the girls seems to reach their peaks in performance around 12 or 13 years. This is also the age of Menarche for many girls.
girls. The present study is supported by Wilmare (1974) who suggested in his study that this imparts pressure to stop running around and to start becoming young lady. The results of the study also support some other studies (Malina and Rarick, 1973; Espenschade, 1968 and Latehew, 1954) done before those came up with the same pattern of development in strength in girls with respect to age.

In case of flexibility, the results demonstrate the significant improvement in flexibility at the age of 12 to 13 years and during rest period of years, there was an very little fluctuation in flexibility as an improvement. The trained girls with continuous participation in physical activities develop a good amount of flexibility and maintain it according to the intensity, duration and quality of activities they perform. According to Sermeev (1966), flexibility can be developed at any age given the appropriate training. There is evidence that even adults benefit from flexibility training. The findings of the present study of trunk flexibility development of untrained and trained girls are in consonance with the findings reported by Leard (1984).

On the other hand girls also showed the improvement in speed, agility and endurance performance but only up to 14 years (in speed and endurance) and up to 15 years (in agility). The reason behind this types of progression in agility and speed may be because of their positively relation to the strength. So may be because of the progressive improvement in strength up to age of 13 and 14, increased tension cultivates into maximum speed as well as the agility development for the work performance and the findings is supported by Kusinitz, (1969) and Hardayal and Tuker, (1964). The maximum development of endurance was observed between 10-11 years (8.15 Sec.) in trained girls and from 14 to 16 years there was a sharp drop in their endurance performance. As already investigated (Adam, 1973), the endurance performance, apart from other factors depends mainly upon physiological factors like heart rate, stroke volume, cardiac output, VO_{2}max, Hemoglobin concentration and Arterio-venous oxygen differences, etc. The phase of deterioration in trained girls might be due to the fact that enough weightage/stress to develop cardio-respiratory endurance training might not have been given in their sports training program during this phase.

On the basis of outcomes and discussion of finding, the present study concludes that from the age of 10 years onwards there is a progressive positive change in growth and the motor development pattern of trained girls and this fact should be borne in mind for developing programs of physical education and sports stress separately for each age in order to take care of individual difference across age. In addition, as much as the cross sectional study has its own limitations, a similar study may be conducted while employing longitudinal method.

REFERENCES


EFFECT OF AQUATIC ACTIVITY AND YOGIC PRACTICES ON PEAK FLOW RATE

Pawan Kumar Roy
Institute of Professional Studies, Gwalior (M.P.)

Dr. Brij Kishore Prasad
HOD, Department of Physical Education, Institute of Professional Studies, Gwalior (M.P.)

ABSTRACT

The purpose of this study was to know the effect of aquatic activity & yogic practices on Peak flow rate. Forty five (45) boys students were selected randomly from Institute of Professional Studies, College of physical education Gwalior, which were divided into three equal groups namely experimental group A for aquatic activity, experimental group B for yogic practices and control group C. Six week training were given to the subjects. Pre and post- test random group design was use for this study. Both pre and post data was collected for these different groups. Peak flow rate was measured through peak flow meter. After deep possible inspiration subject was asked to forcefully expire in one blow. Proper care was taken that the air went out from the mouth only and the reading was recorded in litre/minute. To analysis the collected data of three different groups, Analysis of covariance (ANCOVA) was used and Post hoc LSD was applied for which level of significance was set as 0.05. Finding of the study shows that Peak flow rate was significantly increased.

Key Words: Aquatic Activity, Yogic Practices and Peak Flow Rate

INTRODUCTION

Aquatic activities provide a mean for training and conditioning individuals of all ages and all particularly well suited for development. It should be pointed out that if a specific aquatic activity is not actually planned and conducted often very little physical activity takes place. In other words we can say that aquatic activities means all the movements and activities which we can do under the water, such as water skiing, scuba diving and boating avenue for increased independence and normalization.

Despite the numerous attributes of aquatic exercise, few randomized, controlled studies have been completed substantiating the benefits of exercise in this medium. In addition, the hydrostatic effects of water cause a shift of blood volume from the periphery of the body to the thorax. This increases the central venous pressure, stroke volume and cardiac output, which leads to a decrease in heart rate. This is evidenced in water that is at chest level. The combined influence of water temperature and hydrostatic pressure help to explain why, at a given VO2, heart rate has been shown to be up to 20 bpm lower in water than on land.

Many previous studies have reported metabolic and cardio respiratory responses during walking and jogging in a pool but it was difficult to fix the physical and physiology intensity for walking and jogging in a pool, due to water density, approximately 800 times higher than air (Prampero, 1986). Heart rate has been reported to decrease during head-out water immersion exercise compared with air. The increased hydrostatic pressure of water, concomitant with peripheral vasoconstriction to reduce heat loss forces peripheral blood into the thorax. This result in an enhanced venous return and a decreased stroke volume while maintaining cardiac output. One half to one-third of the speed is needed to walk or jog across a pool through waist-deep water at the same level of energy expenditure as treadmill-walking and jogging. The respiratory index in the aqueous environment is similar to the one
found on land in sub maximal levels and in the maximal effort. Hormonal changes have been observed with sustained periods of water immersion.

“Yoga is not an ancient myth buried in oblivion. It is the most valuable inheritance of the present. It is the essential need of today and the culture of tomorrow.” Today we are entered in 21st century; a spiritual heritage is being reclaimed of which yoga is very much a part. While yoga’s central theme remains the height goal of the spiritual path, yogic practices give direct and tangible benefits to everyone to regardless of their spiritual aims.

According to "Tattvarthasutra," 2nd century CE Jain text, "Yoga," is the sum total of all the activities of mind, speech and body. Umasvati calls yoga the cause of "asrava" or karmic influx as well as one of the essentials—samyakcaritra—in the path to liberation. In his "Niyamasara," Acarya Kundakunda, describes yoga bhakti—devotion to the path to liberation—as the highest form of devotion. Acarya Haribhadra and Acarya Hemacandra mention the five major vows of ascetics and 12 minor vows of laity under yoga. This has led certain Indologists like Prof. Robert J. Zydenbos to call Jainism, essentially, a system of yogic thinking that grew into a full-fledged religion.

The five yamas or the constraints of the Yoga Sutras of Patanjali bear a resemblance to the five major vows of Jainism, indicating a history of strong cross-fertilization between these traditions.

METHODS

To facilitate the study of forty five (45) boys students were selected randomly from the Institute of Professional Studies, College of physical education Gwalior which were divided into three equal groups namely experimental group A for aquatic activity, experimental group B for yogic practices and control group C. Six weeks training schedule was prepared for aquatic training and yogic practices in Institute of Professional Studies, Gwalior (M.P). The variable selected for this study was Peak flow rate. The pre and post-test random group design was use for this study. Both pre and post data was collected for these different groups. Peak flow rate was measured through peak flow meter. After deep possible inspiration subject was asked to forcefully expire in one blow. Proper care was taken that the air went out from the mouth only and the reading was recorded in litre/minute. In the beginning of academic session of College of Physical Education initial data (Pre-Test) was collected. After collecting initial data all the selected subjects were undergone there six (6) weeks of aquatic activity and yoga programme. After completing the six (6) weeks of the physical aquatic activity and yoga programme Post-Test final data were collected. To analyse the collected data of three different groups. Analysis of covariance (ANCOVA) was used and Post hoc LSD was applied. The level of significance was set at 0.05.

RESULTS

In order to determine the effect of aquatic activity and yogic practices to Peak flow rate, descriptive analysis and ANCOVA was used.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Descriptive Statistic</th>
<th>Pre Test</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Minimum</td>
<td>2.50</td>
<td>2.30</td>
</tr>
<tr>
<td>2.</td>
<td>Maximum</td>
<td>5.40</td>
<td>5.60</td>
</tr>
<tr>
<td>3.</td>
<td>Range</td>
<td>2.90</td>
<td>3.30</td>
</tr>
<tr>
<td>4.</td>
<td>Mean</td>
<td>4.21</td>
<td>4.54</td>
</tr>
<tr>
<td>5.</td>
<td>Median</td>
<td>4.50</td>
<td>4.00</td>
</tr>
<tr>
<td>6.</td>
<td>Mode</td>
<td>5.00</td>
<td>4.00</td>
</tr>
<tr>
<td>7.</td>
<td>Standard Deviation</td>
<td>0.666</td>
<td>0.731</td>
</tr>
</tbody>
</table>

Post Test: The table indicates descriptive analysis of peak flow rate for boys where minimum, maximum, range, mean, median,
mode and standard deviation values of this factor are 2.50, 5.40, 2.90, 4.21, 4.50, 5.00 and 0.666 respectively.

Pre Test: The table indicates descriptive analysis of peak flow rate for boys. Where minimum, maximum, range, mean, median, mode and standard deviation values of this agility factor are 2.30, 5.60, 3.30, 4.54, 4.00, 4.00 and 0.731 respectively.

Table No. 2
Analysis of Co Variance of Peak Flow Rate different training programme

<table>
<thead>
<tr>
<th>Sources of Variation</th>
<th>df</th>
<th>Sum of Square</th>
<th>Mean Square</th>
<th>'F' ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>2</td>
<td>1.47</td>
<td>.73</td>
<td>10.62*</td>
</tr>
<tr>
<td>Error</td>
<td>41</td>
<td>2.83</td>
<td>.07</td>
<td></td>
</tr>
</tbody>
</table>

*Significant, F_{0.05} (2, 41) = 5.18

Table shows that there is significant differences schedule different types of training in relation to peak flow rate as the 'F' ratio obtained 10.62 was significantly higher than the tabulated 'F' value of 5.18 required to be significant at 0.05 level of significance.

Table No. 3
L.S.D. post hoc comparison of Peak Flow Rate different training programme

<table>
<thead>
<tr>
<th>Aquatic Training</th>
<th>Yogic Training</th>
<th>Control Group</th>
<th>Mean Differences</th>
<th>Critical Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.16</td>
<td>4.19</td>
<td>-</td>
<td>0.97*</td>
<td>0.19</td>
</tr>
<tr>
<td>5.16</td>
<td>-</td>
<td>4.29</td>
<td>0.87*</td>
<td>0.19</td>
</tr>
<tr>
<td>5.16</td>
<td>4.19</td>
<td>4.29</td>
<td>0.10</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*Significance at 0.05.

Table no. 3 shows that the mean differences between aquatic training and yogic training were 0.97, between aquatic training and control group was 0.87, between yogic training and control group was 0.10. These all were significance at 0.05 levels. Critical difference needed to be significant at 0.05.

DISCUSSION AND CONCLUSIONS

Findings of the study show that there was a significant improvement in physiological variables of the students. It may be due to influence of aquatic training and yogic practices. The reasons for better performance in both the cases are continuous participation in training programme which were related to the development of physiological variables. Further more, the analysis showed that the subjects belonging to the Aquatic training group performed better than the Yogic training group. The reason for the better performance in the case of Aquatic training group may be only possible through exercises against maximum resistance.

In the case of control group the analysis further showed that without participation in any training programme or any physical activity the performance for Physiological variables has determinate.

Within the limitations and delimitations set for the present study and considering the results
obtained, the conclusion drawn was that peak flow rate was significantly increased due to six weeks of aquatic activities and yogic practices.

REFERENCES


COMPARISON OF MENTAL TOUGHNESS BETWEEN PLAYERS OF TEAM GAMES AND INDIVIDUAL GAMES

Dr. Pushpendra Purashwani
Asst. Professor, L.N.I.P.E., Gwalior (M.P.) India

ABSTRACT

The purpose of the study was to examine the mental toughness of players of team games and individual games. For the said objective 30 players from team games and 30 players from individual games of Indian School Muscat, Oman, who have participated at CBSE Nationals, were randomly selected to serve as subjects. For the collection of data Mental Toughness Questionnaire prepared by Allen Goldberg was administered. The questionnaire was comprised of 60 statements based on handling pressure (20 questions), concentration (17 questions), mental rebounding (14 questions) and winning attitude (9 questions). Each statement has two possible responses i.e. true or false. For the analysis of data, collected by administering the questionnaire to all the subjects, t-test was employed at 0.05 level of significance.

The result of the study concluded that there was statistically significant difference in mental toughness between the players of team games and individual games of Indian School Muscat, Oman. This clearly depicts that the mean mental toughness of the players of team games is significantly higher than the mean mental toughness of the players of individual games.

Keywords : Mental Toughness, Team Games, Stressors.

INTRODUCTION

Mental Toughness is the capacity for an individual to deal effectively with stressors, pressures and challenges and perform to the best of their abilities irrespective of the circumstances in which they find themselves struggled.

In sport there is an increasing awareness of how important psychological factors are within athletic performance and it is now being recognized that physical talent is not the only component which leads to success. Players, whether from team games or individual games, are constantly under stress and anxiety while competing in tournaments, they struggle for each point and often put their best efforts to get success. In sports competition, there are situations that require the utmost concentration to face difficult circumstances. It is always questionable that which players, team games or individual game, possess better mental toughness. In the scientific and sport community, mental toughness is viewed as one of the most important attributes that will lead to a successful athletic performance. At the highest level it is often the mental game which separates the elite performers from the good performers. In sport there has been very little scientific attention focusing around mental toughness and this is seen as very surprising considering that it became necessary to compare mental toughness between players of team games and players of individual games of Indian School Muscat, Oman.

METHODS

For the purpose to compare the mental toughness, 30 players from team games and 30 players from individual games of Indian School Muscat, Oman who have participated at CBSE Nationals, were randomly selected to serve as subjects. For the collection of data Mental Toughness Questionnaire prepared by Allen Goldberg was administered. The questionnaire was comprised of 60 statements based on
 handling pressure (20 questions), concentration (17 questions), mental rebounding (14 questions) and winning attitude (9 questions). Each statement has two possible responses i.e. true or false. For the analysis of data, collected by administering the questionnaire to all the subjects, t-test was employed at 0.05 level of significance.

RESULTS
To find out the significant differences in mental toughness between players from team games and players from individual games of Indian School Muscat, Oman t-test was employed at 0.05 level of significance. The statistical analysis of data pertaining to the mental toughness is given below:

**Table - 1**
Significant Differences between the Players of Team Games and Players of Individual Games

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>S.D.</th>
<th>Difference between Mean (DM)</th>
<th>'t' ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Players of Team Games</td>
<td>42.63</td>
<td>8.71</td>
<td>6.8</td>
<td>3.49*</td>
</tr>
<tr>
<td>Players of Individual Games</td>
<td>35.77</td>
<td>6.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

't' _0.05 (58) = 2.00

It is clearly evident from table No. 1 that there was significant difference in mental toughness between the players of team games and individual games of Indian School Muscat, Oman, since the calculated 't' value 03.49 was found to be more than tabulated value 2.00 at 0.05 level. Thus, data provides sufficient confirmation to ensure that the mean mental toughness of the players of team games is significantly higher than the mean mental toughness of the players of individual games of Indian School Muscat, Oman.

DISCUSSION AND CONCLUSIONS
Findings of the study show that there was significant difference in mental toughness between the players of team games and individual games of Indian School Muscat, Oman. This clearly indicates that the mean mental toughness of the players of team games is significantly higher than the mean mental toughness of the players of individual games of Indian School Muscat, Oman. This may be attributed due to the reality that the players of team games get themselves occupied more to prepare mentally for various competitions and participate in competition as a team which develops team cohesion in them and it also helps them to distribute the pressure of the competition. Hence it is necessary to train players of individual games more than the players of team games to enhance the mental toughness. These outcomes may be utilized to develop the various training plans.

REFERENCES


(2006). Mr David Fletcher undertook the study of Organizational stress and/or mental toughness in elite sport

AN ANALYTICAL COMPARISON OF SUPERSTITION BETWEEN MEN AND WOMEN PADDLERS

Dr. Pushpendra Purashwani
Asst. Professor, L.N.I.P.E., Gwalior (M.P.) India

ABSTRACT

Sports figures have fallen into routines, habits, and superstitions that they believe will put them in a better position to win every time. Performance routines are followed, behavioral and cognitive strategies which are intentionally used by players of different games and sports in order to facilitate physical performance. Hence, an analytical comparison of Superstition between Men and women paddlers (Table Tennis Players) is used to assess their behaviour and attitude. For this purpose to examine the prevalence of superstition between men and women paddlers, forty five (45) men and forty five (45) women paddlers of different Universities of West Zone were randomly selected to serve as subjects.

On the basis of Superstitious Beliefs and Behavior Scale prepared by Hans G. Buhrmann, B. Brouch and Maxwell K. Zaugg on seven areas containing forty items, a new scale was constructed with consultation of teachers and experts in the field of physical education and various aspects of table tennis, psychology and sociology. The questionnaire was administered individually to all the subjects and they had answered the questionnaire separately, without consulting others. The responses of the questionnaire were analysed in percentage and compared with non parametric statistics i.e. chi square between men and women paddlers.

A greater prevalence of superstition was found among men paddlers rather than the women paddlers since the responses have showed significant results.

Keywords: Superstition, beliefs, paddlers.

INTRODUCTION

Superstition is belief or beliefs justified neither by reason and evidence nor by any religious canon. Superstitions are often based on unreasoning fear of the unknown forces of nature. This irrational attitude leads an individual to specific practices and misdirected rituals.

Superstitious behavior or ritual can be distinguished from performance routines. Performance routines are learned, behavioral and cognitive strategies which are intentionally used by athletes in order to facilitate physical performance. The popular sports literature and media also state that magical practices are quite prevalent in high intensity sports. The effectiveness of different training programmes and progress of a sports person is measured by understanding his behaviour from time to time. Therefore, observing the felt necessity, it became necessary to analytically compare the superstition between men and women paddlers.

METHODS

For the purpose to examine the prevalence of superstition between men and women paddlers, 45 men and 45 women table tennis players of different Universities of West Zone were randomly selected to serve as subjects.

On the basis of Superstitious Beliefs and Behavior Scale prepared by Hans G. Buhrmann, B. Brouch and Maxwell K. Zaugg on seven areas containing forty items, a new scale was constructed with consultation of teachers and experts in the field of physical education and various aspects of table tennis, psychology and sociology. The questionnaire was administered individually to all the subjects. All the subjects had answered the questionnaire separately, without consulting
others. To analysis the data, collected by administering the questionnaire to all the subjects in West Zone Inter-University Table Tennis Tournament held at Bhopal in the year 2015-16, descriptive statistics analysis was used for each selected characteristics and the responses of the questionnaire were analysed in percentage and compared with non parametric statistics i.e. chi square between men and women paddlers.

RESULTS

The average response of the men paddlers regarding Superstitious Beliefs are presented in Fig. 1:

![Pie Chart](image)

**Fig. 1**: The average response of the men paddlers regarding Superstition

Pertaining to statements of questionnaire, Pie # 1 depicts that a greater percentage (88.22%) of men paddlers have agreed with Superstitious Beliefs.

The average response of the women paddlers regarding Superstitious Beliefs are presented in Fig. 2:

![Pie Chart](image)

**Fig. 2**: The average response of the women paddlers regarding Superstition

Pertaining to statements of questionnaire, Pie # 2 depicts that a greater percentage (62.89%) of women paddlers have agreed with Superstitious Beliefs.

The study had revealed that the superstitious beliefs are most common among the men and women paddlers.

DISCUSSION AND CONCLUSIONS

Finding shows that there was a greater prevalence of superstitious beliefs among men paddlers rather than the women paddlers since the responses have showed significant results. The prevalence may be believed because of myths social customs and traditions and to some extent to supernatural powers among paddlers. They believe that it gives them strength to perform well. Indian culture with various traditions also helps to add to superstitious beliefs which are common among the population since the time immemorial and also generously reflect in the behaviour of paddlers.

REFERENCES


EFFECT OF SURYA-NAMASKAR ON CHOLESTEROL LEVEL

Mr. Subhash S. Dadhe

ABSTRACT

The purpose of the Study was to analyze the effect of Surya-Namaskar on cholesterol level including Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins of college students. To conduct this study, 60 students were examined and declared 50 of them were medically fit for this study. They were divided randomly into two groups as one control and one experimental group, out of which group I (N-25) underwent Surya-Namaskar activity and group II (N-25) kept as control group (N-25). Pre test was conducted for both the groups on Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins. The experimental group participated in their respective Surya-Namaskar Exercise for a period of six weeks. Post test were conducted on the above mentioned dependent variables after six weeks of the training period. Blood sample was collected from individual’s ear lobe in the morning with empty stomach to check the value of the individual Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins in pre and post training session. The blood sample was analyzed in the biochemistry lab in Nagpur. Data was analyzed using SPSS. The ‘t’ test statistical techniques was used to find out the effect of Surya-Namaskar on cholesterol level including Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins. A significant level of \( P < 0.05 \) was considered significant different. The results of the study indicate that the daily Surya Namaskar activity increases higher level of HDL in blood in experimental group than the control group. It also clearly indicate that there is a significant difference between experimental group and control group scores on Low Density Lipoproteins and High Density Lipoproteins.

Keywords: Surya-Namaskar, Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins.

INTRODUCTION

The universal need and importance of daily exercise and Surya-Namaskar cannot be ignored at least in the present modern high-tech artificial world. Because of the inventions of the man made machines the man himself has made his organs so weak that its survival has been in dangerous situation resulting less life span and many serious life killing diseases like Blood Sugar, Blood Cholesterol, Heart Attack, Kidney Failure, Heart Disease etc. Heart Disease contains many type of disease like Angina Pectoris, Arteriosclerosis, Cordia Arrest, Valvular Heart Disease and Coronary Heart Disease.

The present discussion is in relation to the Coronary Heart Disease only. Coronary Heart Disease can occur due to deformity in heart vein. Increase in cholesterol level is one of the reasons of coronary obstruction.

Cholesterol the fat like substance is the word that most people especially the middle age group and above hate to hear. The flipped side is that our body needs cholesterol for function such as making hormones. Besides being found in those products above, it is also produced in our body.

What is Surya Namaskar?

Surya Namaskar (Sun salutation) is an ancient Indian method of offering prayers to the rising Sun in the morning along with a series of
physical postures with regulated breathing aiming at range of physical, mental and spiritual benefits. Facing east, in the early hours of morning, one standing with serene mind offers prayer to Lord Sun (Surya in Sanskrit) with Surya-Namaskar. Along with physical postures, Surya-Namaskar has specific spiritual connotations attached to it. Surya-Namaskar is a graceful combined sequence of twelve positions along with regulated breathing and relaxation.

Due to this problem the investigator try to get solution and found positive way to control cholesterol level without expenses and assess of the benefit of Surya-Namaskar on student suffering from abnormal cholesterol level.

**METHODS**

To execute this investigation, the investigator randomly selected fifty men student in Dhanwate National College, Nagpur. Only belonging to the age group of 18-24 years. they were divided in to two equal groups of twenty five subjects each and assigned as a Experimental Group-I and Control Group-II on the basis of randomization.

The selected fifty subjects were randomly divided in to two groups of fifteen each, out of which group I Underwent Surya-Namaskar activity, whereas Group II remained as control group. Pre test were conducted for all two groups Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins. The experimental group participated in their respective Surya-Namaskar Exercise for a period of six weeks. Post test were conducted on the the dependent variables after six weeks of the training period.

Blood sample was collected from individual’s ear lobe in the morning with empty stomach to check the value of the individual Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins in pre and post training session.

The blood sample was analyzed in the biochemistry lab in Nagpur.

The data was collected and the analysis on mean values and SD. The 't' test statistical techniques was used to find out the effect of Surya-Namaskar on cholesterol level including Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins. A significant level of P<0.05 was considered significant different. Data was analyzed using SPSS.

**RESULTS**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>S.E.</th>
<th>t’ Ratio</th>
<th>Required T Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>Pre-Training</td>
<td>25</td>
<td>221.96</td>
<td>32.58</td>
<td>8.32</td>
<td>2.62</td>
<td>3.1706*</td>
</tr>
<tr>
<td></td>
<td>Post-Training</td>
<td>25</td>
<td>213.64</td>
<td>38.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG (mg/dl)</td>
<td>Pre-Training</td>
<td>25</td>
<td>243.88</td>
<td>94.82</td>
<td>5.6</td>
<td>0.483</td>
<td>11.5931*</td>
</tr>
<tr>
<td></td>
<td>Post-Training</td>
<td>25</td>
<td>238.28</td>
<td>93.97</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>Pre-Training</td>
<td>25</td>
<td>36.96</td>
<td>5.42</td>
<td>5</td>
<td>1.618</td>
<td>3.0911*</td>
</tr>
<tr>
<td></td>
<td>Post-Training</td>
<td>25</td>
<td>41.96</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VLDL (mg/dl)</td>
<td>Pre-Training</td>
<td>25</td>
<td>48.696</td>
<td>18.85</td>
<td>2.916</td>
<td>0.484</td>
<td>6.0214*</td>
</tr>
<tr>
<td></td>
<td>Post-Training</td>
<td>25</td>
<td>45.78</td>
<td>17.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>Pre-Training</td>
<td>25</td>
<td>136.30</td>
<td>35.3</td>
<td>6.728</td>
<td>0.699</td>
<td>9.6116*</td>
</tr>
<tr>
<td></td>
<td>Post-Training</td>
<td>25</td>
<td>129.57</td>
<td>34.12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant, t_{05 (48)} = 2.0106

An examination of the table 1 revealed that the mean of total Cholesterol in pre-training is 221.96 and SD 32.588 and in post training mean is found 213.64 and SD 38.23 similarly an examination of same table revealed that there is significant difference in the mean for cholesterol of Pre-training and Post training as the obtained t’ ratio value 3.1706 is more than the required t’ ratio value 2.0106 at 0.05 level.

The mean of Triglyceride in pre-training is 243.88 and SD 94.82 and in post training mean is found 238.28 and SD 93.97 Similarly an examination of same table revealed that there insignificant difference in the mean for...
Triglyceride of Pre-training and Post training as the obtained 't' ratio value 11.5931 is more than the required 't' ratio value 2.0106 at 0.05 level.

The mean of HDL in pre-training is 36.96 and SD 5.42 and in post training mean is found 41.96 and SD 6 similarly an examination of same table revealed that there is significant difference in the mean for HDL of Pre-training and Post training as the obtained 't' ratio Value 3.0911 is more than the required 't' ratio value 2.0639 at 0.05 level.

The mean of VLDL in pre-training is 48.696 and SD 18.85 and in post training mean is found 45.78 and SD 17.03 similarly an examination of same table revealed that there is significant difference in the mean for VLDL of Pre-training and Post training as the obtained 't' ratio value 3.0911 is more than the required 't' ratio value 2.0639 at 0.05 level.

The mean of LDL in pre-training is 136.30 and SD 35.3 and in post training mean is found 129.57 and SD 34.12 similarly an examination of same table revealed that there is significant difference in the mean for LDL of Pre-training and Post training as the obtained 't' ratio value 3.0911 is more than the required 't' ratio value 2.0639 at 0.05 level.

The mean of Cholesterol in pre-training is 216.12 and SD 52.14 and in post training mean is found 223.2 and SD 52.27 similarly an examination of same table revealed that there is no significant difference in the mean for Cholesterol of Pre-training and Post training as the obtained 't' ratio value 0.4795 is less than the required 't' ratio value 2.0106 at 0.05 level.

The mean of Triglyceride in pre-training is 265.04 and SD 112.12 and in post training mean is found 270.24 and SD 110.12 similarly an examination of same table revealed that there is no significant difference in the mean for Triglyceride of Pre-training and Post training as the obtained 't' ratio value 0.1654 is less than the required 't' ratio value 2.0106 at 0.05 level.

DISCUSSION AND CONCLUSIONS

This good cholesterol carries LDL back to the liver, where it is converted to single lipoprotein and helps to prevent cholesterol build-up in
blood vessels. Low HDL level increases the heart disease risk. The result surprisingly indicated that the sedentary student having (19.00) low HDL than the physically active student (21.00). In trained person, the result clearly indicated that there was optimum level of HDL in the blood than the sedentary students.

There is a significant difference between pre and post training. The Experimental Groups LDL level is decreased because they are physically more active due to doing daily Surya-Namaskar and their endocrine secretion is more suitable. As the inactive students is physically less active their secretion of endocrine gland is less, automatically the chances are more for the cholesterol to get deposited in blood and arteries and leads of block the blood vessels.

- Study indicates the duration of training and changes in HDL level are directly proportional.
- Study indicates the HDL level and LDL level are indirectly proportional.

It was concluded that the Surya-Namaskar can improve HDL level and at the same time the LDL level will decrease significant. If the inactive student follows the Surya-Namaskar training will improve the good and reduce bad cholesterol.

- Regular exercise can help to improve cholesterol levels
- Change of lifestyle also can help in improving HDL cholesterol levels
- Eat a healthy diet, get regular physical activity and avoid smoking
- Lifestyle changes are the first line of defence against high cholesterol.

REFERENCES


COMMON LOWER LIMBS INJURY AMONG FIELD HOCKEY PLAYERS

Dr Sujay Bisht
Assistant professor, L.N.I.P.E, N.E.R.C, Guwahati (Assam)

ABSTRACT

The purpose of the study to examine the common injuries of lower limbs among field hockey players at different field position during practice as well as game. It was hypothesized that ankle sprain is one of the highest rate of injury at lower limbs site. National level field hockey player from Manipur and Assam state of north eastern region of India was selected as subject for the study. They all are responding a questionnaire including personal characteristics of each and individual players like (age, height, weight); field hockey professional information (level of play, year of experience, playing surface); players injury history (site, types, cause etc.). The rate of injury per athlete per year also calculated. More than half of the total 165 lower limbs injury occurred in ankle (sprain) around 55.75%, the next most frequent injury was wounds with 22.42% followed by knee injury 14.54%, abrasion 6.06% & fracture only 1.81%. After determining the rate and risk of injury to different field position. Overall forward had the highest rate of injury (0.67 injury/athlete-year), (0.64 injury/athlete-year) to backfield players followed by (0.62 injury/athlete-year) and (0.22 injury/athlete-year) to midfield and goal keeper respectively. Due to the different field position the pattern & rate of injury were different. It also revealed that not only there is a difference in the rate of injury between playing position, but also in the types of injury sustain at different position.

Key words: Sprain, Wounds, Astroturf, Acute injury, Natural surface.

INTRODUCTION

Field hockey is one of the oldest sports in existence: 4,000 year-old wall decorations from the tomb of Kheti in Egypt depict players with rudimentary "crooks" and a ball. Although field hockey is classified as a non-contact sport, acute injuries may result from contact with a stick, the ball, another player or the playing surface or goal cage. Lower limbs injuries are the most frequent injury in sports. Inversion-type ankle sprains have been estimated to comprise roughly 15 percent of all injuries sustained during field hockey participation. Knee injuries, including anterior cruciate ligament (ACL) tears, are very common, as are muscle strains, particularly of the quadriceps and hamstrings. The nature of sports puts extraordinary amount of strain on muscles in the back and pelvic region, which is supported by the large proportion of muscles. There have been numerous rules change in past few years like offside rule has been eliminated and introducing new substitution rules (Rolling substitution). Some of field hockey experts, coaches and players believe that the elimination of offside rule leads to more player near goal area & increased chance of injury. The injuries like ankle sprain and contusion are also one of the common injuries in the field hockey sports. While these injuries are still common injuries such as tendonitis, fracture and compartment syndrome appears to be increasing in frequency. This is uncountable due to the increased load placed upon musculoskeletal structure by the increased training demands of modern day. “The study conducted by Dick and et.al(2007) on National Collegiate Athlete Association injury rate of field hockey is 6.3/1000 athlete exposure. Training on natural surface demonstrated more injuries (64.87%)
as compared to artificial surface (35.13%)".

METHODS

Total (n=35) male field hockey players was chosen and cross sectional design were applied. All the subject were selected from two states of north east region of India i.e. Manipur and Assam and they all represent national level from their respective states in last three year. The range of age was from 18 -24 year (age=19.6±2.4) and authentic documents were collected as age proof from the concern subjects. Whole subject were divided into four groups on the basis of field position like goal keeper (5), backfield (10), midfield (10), and forward (10). A written concern was obtained regarding the study. A questionnaire was designed for quick and easy response and it took around 30 min to fill properly. The questionnaire includes age, year, playing experience, height and weight. Personal field hockey experience like level of play, playing surface, protective gears, and most important history of injury (site, types & causes of injury), all these information were collected from said questionnaire. The risk and rate of injury were also calculated with help of following formula:-

\[
\text{Injury rate} = \times \text{No. of players in a group}
\]

RESULTS

The mean physical characteristic of all three group including age, year of experience, height and weight were presented in Table 1. The subjects had a total average age of (19±2.4yrs) and (7.8±1.5) year of playing experience. The forward players were the most experience group (8.5±2 yrs) where the goal keeper had a least experience (7.2±1).

The presentation of the number of injury at lower limbs of the body shows in table -2

<table>
<thead>
<tr>
<th>Position</th>
<th>Goalkeepers (5)</th>
<th>Backfield (10)</th>
<th>Midfield (10)</th>
<th>Forward (10)</th>
<th>Total (35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Limbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ankle sprain</td>
<td>4</td>
<td>30</td>
<td>27</td>
<td>31</td>
<td>92</td>
</tr>
<tr>
<td>Knee injury</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Fracture</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Wounds</td>
<td>1</td>
<td>12</td>
<td>10</td>
<td>14</td>
<td>37</td>
</tr>
<tr>
<td>Abrasion</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

More than half of the total 165 lower limbs injury that occurred in ankle (sprain) around 55.75%, the next most frequent injury was wounds with 22.42% followed by knee injury 14.54%, abrasion 6.06% & fracture only 1.81%. This percentage of different site of lower limbs was presented in figure -1.
of injury to different field position. Overall forward had the highest rate of injury (0.67 injury/athlete-year), (0.64 injury/athlete-year) to backfield players followed by (0.62 injury/athlete-year) and (0.22 injury/ athlete-year) to midfield and goal keeper respectively. The most common cause of injury was surface (51%) followed by ball (26%), collision (20%) and stick (3%) respectively.

DISCUSSION AND CONCLUSIONS

The lower limbs are the most vulnerable site of injury in hockey players. In today's modern field hockey the types and pattern of injury were different from traditional hockey. In today's scenario the playing surface, protective gears, player's maturity and F.I.H rule implementation decrease the chances of acute injuries. But on the other hand some improvised and modern stick and ball manufacture allow the players to hit the ball with greater velocity which may leads to serious injuries. As already mentioned in above results most frequent injuries were reported to lower limbs including highest no's at ankle site, followed by wounds, knee injury, abrasion and fracture respectively. Regularly practiced in natural surface like grass and clay increases the chances of injuries due to uneven surface, sudden bounce of ball, improper stopping etc , these are some common problem players are facing while playing on natural surfaces,. Player's maturity and skill level also affect the rate of injury. But to avoid injuries and smoothness of game artificial surface are largely used in modern hockey not only in colleges and university but in school level too. To countermeasure further investigation required for vast descriptive research on injury at different site of player's body.

From the above data analysis and evaluation it was revealed that ankle sprain was the most frequent injuries in lower limbs. But on the other hand the rate of serious injuries in field hockey is very low. The other aspect and cause also needed to indentify and discover in different playing situation and also required multi disciplinary approaches.

REFERENCES


ASSOCIATION BETWEEN BALL VELOCITY AND HAND GRIP STRENGTH OF MALE CRICKET PLAYERS

Sukanta Goswami
Ph.D scholar, Department of Centre for Advanced Studies (C.A.S.), 'LNIPE, Gwalior (M.P.), India.

V.K. Srivastava
Professor & HOD, Department of Exercise Physiology, LNIPE, Gwalior, India.

Yajuvendra Singh Rajpoot
Assistant Professor, Department of Sports Biomechanics, LNIPE, Gwalior, India.

ABSTRACT
The aim of the current study was the investigation of the relationship between ball velocity and hand grip strength of male off-spin bowlers in cricket (n = 30, mean ± SD age 19.80 ± 1.16 yrs and playing experience 3.66 ± 1.66 yrs). Velocity of ball was measured by dividing distance i.e. the distance of 18.90 mt [20.12 mt (total length of the pitch) - 1.22 mt (Popping Crease)] between the two ends of cricket pitch, and the time taken by the ball to travel that distance, and the maximal handgrip strength of the dominant hand (right) was measured using a hand grip dynamometer. While body height, body mass, arm length and palm length were also measured. The results showed that ball velocity is significantly (p<0.05) correlated with hand grip strength calculated in this study. This suggests for off-spin bowlers in cricket that ball velocity requires advanced hand grip strength for these ages.

Keywords: team cricket, off-spin bowlers, correlation, average velocity, strength.

INTRODUCTION
Bowling is considered as one of the most important technical skills in competitive sports cricket as it is a major determinant of all actions taken by the bowlers. In cricket, the off-spin bowler achieves rapid flexion of the fingers around one side of the ball; it is created by the movement of the index finger pulling down on the seam of the ball at the point of release. Previous biomechanical literatures have focused mainly on fast bowling kinematics and point towards the ball velocity is an important factor of fast bowling success. A faster run-up velocity is associated with increases in ball velocity (Elliott and Foster, 1984; Elliott, John & Foster, 1989; Bartlett et al., 1996). Glazier, Paradisis & Cooper, (2000) attributed the greater bowling speeds of elite performers not only to run-up speed, but also to increased velocities of each joint. A more recent study has established a link between increased elbow flexion and ball release velocity in fast bowling (Roca et al., 2006). Despite high interest in fast bowling kinematics, little research has been performed on spin bowling, Marshall & Ferdinands, (2003) reported that the effect of altering elbow kinematics on ball speeds. Lloyd, Alderson & Elliott, (2000) who published a case study on the bowling action of Muttiah Muralitharan, providing some quantification to this bowling form. Justham, West & Cork, 2008, and Chin et al., 2009, both finding that the ball velocities of off-spinners were faster in the higher performance levels.

Anthropometric measurements, body composition, body size and proportions are playing an important role in physical performance and fitness of the sportsman. Anthropometric dimensions and morphological characteristics play an important role in determining the success of an athlete (Reco-Sanz, 1998; Keogh 1999; Wilmore and Costill, 1999). Bayios, (1998)
reported body size, upper and lower extremities' length as factors that influence ball velocity. Joris et al., (1985) and Hong et al., (2001) reported ball velocity to be positively correlated to muscular strength and neuromuscular coordination.

To the best of our knowledge, the information regarding the association of hand grip strength and ball velocity of male off-spin bowlers in cricket is lacking. So the present study was planned. The aim of the study was to identify whether such a relationship between ball velocity and hand grip strength exists in young off-spin bowlers in cricket. It was hypothesized that the player's ball velocity would be positively related to the hand grip strength.

METHODS

Thirty male off-spin bowlers from team cricket at the LNIPE, Gwalior participated in this study (n = 30) by using purposive sampling. The age of the subjects was mean ± SD age 19.80 ± 1.16 yrs and playing experience 3.66 ± 1.66 yrs and all were regular players with good level of skill. To aid logistics, all bowlers were right-handed. The purpose of the research was explained to the subjects and they were motivated to put their best during each attempt. The average height and body mass of the subjects were 175.19 ± 6.33 cm and 62.53 ± 6.46 kg, respectively. All subjects underwent the same testing protocol and were injury free at the time of testing. Before participation, informed consent was obtained from each subject.

Testing evaluated body height, body mass, arm length, palm length, handgrip strength and ball velocity. Height was measured at standing position with the shoulders and heels adjacent to a wall using a stadiometer. Body mass was measured by digital standing scales. The readings were recorded from the scales of the digital weighing machine. Arm length was measured from the acromiale to tradiale, and palm length from the mid-sty lion to dactylion.

The maximal handgrip strength of the dominant hand (right) was measured using a hand grip dynamometer. All subjects performed three trials with the dominant hand, and the best performance was used. All variables except height and weight were measured on the right side of the body. Different body measurements were registered following the guidelines proposed by the International Society for the Advancement of Kinanthropometry (ISAK, 2001). Velocity of ball was measured by dividing distance i.e. the distance of 18.90 mt [20.12 mt (total length of the pitch) - 1.22 mt (Popping Crease)] between the two ends of cricket pitch, and the time taken by the ball to travel that distance. For the purpose of measuring the velocity of the ball, camera (Nikon D-3100; 25 frames/second) was placed on the sagittal plane, perpendicular to the center of the pitch. The distance of the camera from the center of the pitch was 22.50 meters away and the height of the lens was 1.00 meters from the ground. The camera was set-up on a rigid tripod. The recorded videotapes were digitized and analyzed on a motion analysis system (Kinovea Software; 0.8.15). All subjects performed three trials and the best performance was used.

The descriptive statistics (mean, standard deviation, skewness, kurtosis etc.) was used for testing the assumption of normality and to know the nature of data. All data are presented as mean with standard deviations. Pearson's product moment correlation coefficient (r) was used for evaluating the various relationships of the selected variables towards the ball velocity. A significance level of 5% was accepted. The raw data were calculated in Statistical Package for Social Science (SPSS; Version 20.0).

RESULTS

Descriptive statistics for all variables are presented in Table 1. The results of the descriptive statistics indicated that all the variables are symmetrically distributed, as
none of the variables skewness is greater than twice its standard error. Similarly, the value of kurtosis for the data to be normal of any of the variable is not more than twice its standard error of kurtosis hence none of the kurtosis values are significant. In other words the distribution of all the variables is meso-kurtic.

Table 1: Descriptive statistics for evaluating the nature of the data of selected variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Velocity of the Ball (m/s)</td>
<td>12.04</td>
<td>15.86</td>
<td>13.28</td>
<td>1.12</td>
<td>-0.717</td>
<td>-0.371</td>
</tr>
<tr>
<td>Age</td>
<td>17</td>
<td>22</td>
<td>19.80</td>
<td>1.66</td>
<td>-0.584</td>
<td>0.053</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>158.50</td>
<td>184</td>
<td>175.19</td>
<td>6.33</td>
<td>-0.748</td>
<td>-0.034</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>53</td>
<td>80</td>
<td>62.53</td>
<td>6.46</td>
<td>0.820</td>
<td>0.419</td>
</tr>
<tr>
<td>Arm Length (cm)</td>
<td>17.40</td>
<td>85</td>
<td>77.03</td>
<td>11.67</td>
<td>-4.898</td>
<td>25.623</td>
</tr>
<tr>
<td>Palm Length (cm)</td>
<td>18</td>
<td>21</td>
<td>19.53</td>
<td>0.79</td>
<td>0.053</td>
<td>-0.460</td>
</tr>
<tr>
<td>Hand Grip Strength (kg)</td>
<td>41</td>
<td>56</td>
<td>47.43</td>
<td>4.17</td>
<td>0.370</td>
<td>-0.610</td>
</tr>
</tbody>
</table>

Table 2: Correlation between velocity of ball and selected variables for evaluating the relationship of selected variables with average velocity of ball.

<table>
<thead>
<tr>
<th>Average Velocity of the Ball (m/s)</th>
<th>Age</th>
<th>Height</th>
<th>Weight</th>
<th>Arm Length</th>
<th>Palm Length</th>
<th>Hand Grip Strength (Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>0.268</td>
<td>-0.047</td>
<td>-0.087</td>
<td>0.019</td>
<td>0.030</td>
</tr>
</tbody>
</table>

* Significant $r_{105}(28) = 0.361$

Table 2 reveals that the significance level for each of the correlation coefficients at 0.05. Significance has been tested for two-tailed test. Table is showing only upper diagonal values of the correlation matrix and the magnitude of correlation coefficients along with their p values and sample size. Thus, at 28 degrees of freedom, the critical value of $r$ at 5% is 0.361. The correlation coefficient with one asterisk (*) mark is significant at 5% level. Hand grip strength (right) is significantly correlated with average ball velocity at 5% level ($r = 0.405$), correlation coefficient having p value less than 0.05 are significant at 5% level. Whereas no significant relationship was obtained between rests of the variables to the average velocity of the ball. Therefore it was evident that hand grip strength (right) shows a significant relationship to average velocity of the ball.

**DISCUSSION AND CONCLUSIONS**

In the present study, main finding is the strong correlation of ball velocity to hand grip strength, compared to other parameters. This suggests that importance of the hand grip strength in cricketers. The findings of the study indicate that right hand grip strength had significantly positive correlations with ball velocity ($r = 0.405$), so use of hand grip strength is essential for bowling and the purpose of the study was fully justified. In this direction, Skoufas et al., (2003) recorded that the stable ball grip allows the athlete to maximally accelerate the ball during the whole throwing movement. The present study, in consistence with previous research found a strong positive correlation between throws and the sex in all age groups with the boys outmatching the girls (Roberton & Konczak, 2001). Recently, it was found that elite rock climbers have more right hand grip strength than recreational climbers (Grants et al., 2001). According to Ducher et al.,(2004) lean tissue mass or grip strength is adjusted with forearm bone mineral content and higher on the dominant side, reported that tennis playing exerted a direct effect on bone. We could not find any similar studies concerning off-spin bowlers in team cricket, but we found similar study viz. Pugh et al., (2001) reported that the greatest increase in handgrip strength correlated with throwing speed in experienced pitchers and later they showed no relationship between ball speed and strength during tennis serve (Pugh et al., 2003). Consistent with previous findings, Pyne et al., (2006) found that higher ball velocity is associated with larger physical stature and greater strength of bowlers. Pyne et al., (2006); Stockill & Bartlett (1994); Glazier et al., (2000) is agreement finding that have a strong correlation to ball release velocity are shoulder-to-wrist length and total arm length. Johnstone
and Ford (2010) suggested that coaches should focus on developing lower-body speed (explosive and repetitive) and anaerobic upper-body power within players. It is well known that the achievement of greater velocity muscular performance is an essential requirement (Pedegana et al., 1982). Tillaar and Ettema (2004) showed that positive correlation between isometric handgrip strength and ball throwing velocity for female and male team handball players. It therefore seems that certain level of strength is required for successful bowling proficiency in cricket. Furthermore, maximum ball velocity may be governed by factors such as lever lengths and body proportions which cannot be altered.

REFERENCES


ASSESSMENT OF RELATIONSHIP AMONG THREE SELECTED METHODS OF LONGITUDINAL PLANTAR ARCH IN PHYSICALLY ACTIVE ADULTS

Dr V. D. Bindal,
Associate Professor, Dept. of Health Education, LNIPE, Gwalior

Gayatri Pandey
Ph. D Scholar LNIPE, Gwalior

Padmakar
Ph. D Scholar, LNIPE, Gwalior

ABSTRACT

The purpose of this study was to assess the relationship among three selected methods of longitudinal plantar arch in physically active adults. A total of two hundred twenty three subjects (N = 223), of both the genders with the age range of 20 ±1.54 years of B.P.Ed and M.P.Ed 1st year students from L.N.I.P.E Gwalior, were evaluated. Footprints acquisition was performed with pedograph in the bipedal position with bilateral weight bearing. Therefore total sample consisted of 446 plantar prints. After the plantar prints, the MLA classification variables were calculated: CSI, SI and AA. Means and standard deviations were calculated as descriptive statistics and to find out the relationship among three methods of foot arch, Pearson Product Moment correlation was employed and the level of significance was set at 0.01 level of confidence. The findings reveal that both Chipaux-Smirak Index (CSI) and Staheli Index (SI) methods were negatively correlated with the Alpha Angle (AA), whereas Chipaux-Smirak Index (CSI) method was positively correlated with the Staheli Index (SI) method.

Keywords - Longitudinal Arch, Pedograph, Chipaux-Smirak Index (CSI), Staheli Index (SI), Alpha Angle (AA).

INTRODUCTION

Human body is a complex structure; each part is arranged to form a well-organized unit and each part plays a role in the operation of the unit as a whole. While reviewing the concepts about human foot evolution, it is noticed that the lower limb, and particularly the foot, is amongst the most distinctive characteristics of human anatomy. In the field of orthopaedics one of the most commonly discussed topics, particularly in the paediatric area, are the static-postural changes of the feet (Hernandez et. al., 2007). The feet are flexible structures of bones, joints, muscles, and soft tissues that let us stand upright and perform activities like walking, running, and jumping (Wikipedia). Some combination of abnormal structure and mechanics in the foot may put an individual at an increased risk for injury.

The bones in human feet are arranged to form three arches. Foot prints of hominoids already demonstrated the existence of a plantar arch 3.7 million years ago, and during human evolution, feet and not hands experienced extraordinary changes (Laitman,1982). The arches in the foot are considered to play functionally significant roles by supporting body weight and reducing the impact of the body during running and walking (Emi et. al., 2014). During standing, the arch is thought to not only support weight but also contribute to dynamic postural control and equilibrium maintenance; however, these functions have not been fully elucidated.
One of the most important characteristics presenting the highest level of variability of human foot is the medial longitudinal arch (Cavanagh & Rodgers, 1987). The medial longitudinal plantar arch (MLA) has an important function in foot biomechanics, like support, sustain and absorption of foot impact during walking (Forriol & Pascual 1990; Robin, 2007) and running. The decrease or increase of MLA (flat feet or cavus feet) can weaken these features leading to the muscular imbalance, articular misalignment and gait imbalance (Franco, 1987). It is well known that anthropometric measures of foot vary with respect to population. If people's shoes are not related to these measures can consequence in trouble, discomfort and finally lead into deformities. The deformation experienced by the medial longitudinal arch during support makes feet to be the region suffering the highest variations in human body.

The medial longitudinal arch (MLA) can be assessed by several methods, observation, qualitative plus clinical methods, used in posture assessment which involves direct and indirect anthropometrical measuring methods. In pedographic analysis, plantar prints can be easily obtained, are a fast, simple, inexpensive, and non-invasive way to obtain everlasting register of morphological features of foot. Some of the methods which are generally used for MLA assessment using plantar print are the Chipaux–Smirak Index (CSI), the Staheli Index (SI), and the plantar print Alpha Angle (AA). These methods offer good repeatability (Nikolaidou & Boudolos, 2006) and reliability inter-and intra observer (Robin et al., 2007). The researchers have made a humble attempt to go through various studies conducted on the measurement of foot arch by various methods, however, there are hardly any such and certain studies with respect to the correlation among these methods. Therefore, the objective of this study was to find out the relationship among these three selected methods of longitudinal plantar arch.

**METHODS**

The methodology of the study consisted of selection of subjects, procedure of data collection and statistical technique employed for analysis of data.

For the purpose of the study, two hundred twenty three subjects (N = 223), of both the genders with the age range of 20 ±1.54 years of B.P.Ed and M.P. Ed 1st year students from L.N.I.P.E Gwalior were evaluated. Therefore, total sample consisted of 446 plantar prints.

In order to acquaint the subjects with the purpose of research being conducted, all the subjects were assembled in the Physiotherapy section of the Health Centre of L.N.I.P.E Gwalior (M.P). Their consent was obtained for their participation in data collection. Those with history of previous ankle or foot injury were excluded from the data collection.

Footprints acquisition was performed with pedograph in the bipedal position with bilateral symmetric weight bearing. The pedography instrument consisted of an ordinary wooden picture frame or platform over which a light rubber sheet was stretched. The rubber sheet remains above the floor parallel to the picture frame. A sheet of white paper is placed on the floor underneath the wooden picture frame or platform in such a way that edges of paper sheet on all four sides remain pressed. The regular stamp ink (or finger print ink) is evenly rolled on the under surface of the rubber sheet with the help of an ink roller. Thus, the surface of the rubber sheet impregnated with stamp ink faces the upper surface of the white paper on which the foot print was taken. The subject was asked to stand with both the feet, bare footed, on the top side of rubber sheet while watching the horizon, thus a clear impression of plantar surface of both the feet was obtained on the paper sheet. During printing acquisition, two physiotherapists, with the help of research scholars obtained plantar arch of the feet in all
the subjects. Two foot prints (left & right foot) were collected for each subject. After the plantar prints, the MLA classification variables were calculated: CSI, SI and AA.

The CSI is the ratio between the smallest length of mid-foot and the largest length of the metatarsal heads region (Fig. 1).

Fig. 1 Graphical illustration of lines used for the calculation of CSI. CSI=b/a; CSI is Chipaux-Smirak Index; (a) Maximal width of the metatarsal print; (b) Minimal width of the MLA’s area being (b) parallel to (a).

The SI is the ratio of the smallest length of the mid-foot and the largest length of the heel (Fig. 2).

Fig. 2 Graphical illustration of lines used for the calculation of SI. SI=b/a; SI is Staheli Index; (b) Minimal width of the MLA's area; (c) maximal width of the heel print, being (c) parallel to (b).

The AA is the angle formed between the line that joins the most medial point of the metatarsal heads region with the apex of the concavity of MLA print and the internal tangent of the plantar print (Fig. 3).

Fig. 3 Graphical illustration of lines used for the calculation of AA, in which \( \alpha \) is the angle between the medial borderline of the footprint and the line connecting the most medial point of metatarsal region and the apex of the concavity of the MLA.

Statistical analysis was done with SPSS (Statistical Package for the Social Sciences, 20.0, USA). Means and Standard deviations were calculated as descriptive statistics and to find out the relationship among three methods of foot arch, Pearson Product Moment correlation was employed and the level of significance was set at 0.01 level of confidence.

RESULTS

Table 1

<table>
<thead>
<tr>
<th>Methods</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipaux- Smirak Index Right Foot (CSIRF)</td>
<td>223</td>
<td>0.30</td>
<td>0.07</td>
</tr>
<tr>
<td>Chipaux- Smirak Index Left Foot (CSILF)</td>
<td>223</td>
<td>0.29</td>
<td>0.08</td>
</tr>
<tr>
<td>Staheli Index Right Foot (SIRF)</td>
<td>223</td>
<td>0.54</td>
<td>0.13</td>
</tr>
<tr>
<td>Staheli Index Left Foot (SILF)</td>
<td>223</td>
<td>0.52</td>
<td>0.11</td>
</tr>
<tr>
<td>Alpha Angle Right Foot (AARF)</td>
<td>223</td>
<td>46.97</td>
<td>11.11</td>
</tr>
<tr>
<td>Alpha Angle Left Foot (AALF)</td>
<td>223</td>
<td>46.86</td>
<td>9.88</td>
</tr>
</tbody>
</table>

Note: CSI & SI Measured in cm, AA measured in degrees.
Table 1 shows the Means & Standard deviations of three methods of foot arch measurement. The Means along with SD of Chipaux-Smirak Index, Staheli Index and Alpha Angle on right and left foot were 0.30 ± 0.07, 0.29 ±0.08, 54 ± 0.13, .52 ± 0.11, 46.97± 11.11 and 46.86 ± 9.88 respectively.

Table 2
Pearson Product Moment Correlation among Three Methods of Longitudinal Plantar Arch

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Method 1</th>
<th>Method 2</th>
<th>N</th>
<th>Pearson Correlation</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CSIRF</td>
<td>AARF</td>
<td>223</td>
<td>-.505*</td>
<td>.00</td>
</tr>
<tr>
<td>2</td>
<td>CSILF</td>
<td>AALF</td>
<td>223</td>
<td>-.673*</td>
<td>.00</td>
</tr>
<tr>
<td>3</td>
<td>SIRF</td>
<td>AARF</td>
<td>223</td>
<td>-.533*</td>
<td>.00</td>
</tr>
<tr>
<td>4</td>
<td>SILF</td>
<td>AALF</td>
<td>223</td>
<td>-.661*</td>
<td>.00</td>
</tr>
<tr>
<td>5</td>
<td>CSIRF</td>
<td>SIRF</td>
<td>223</td>
<td>.949*</td>
<td>.00</td>
</tr>
<tr>
<td>6</td>
<td>CSILF</td>
<td>SILF</td>
<td>223</td>
<td>.967*</td>
<td>.00</td>
</tr>
</tbody>
</table>

*Significant

Table 2 shows the Pearson Product Moment correlation between CSI, SI and AA of left and right foot along with their p-values and sample size. The Chipaux-Smiak Index (CSI) for right foot is found to be negatively significantly correlated (-.505) with the Alpha Angle for right foot, and the CSI for left foot is also found negatively significantly correlated (-.673) with the Alpha Angle for left foot. Similarly, Staheli Index (SI) for right foot is found to be negatively, significantly correlated (-.533) with the Alpha Angle for right foot, and the Staheli Index for left foot is also found negatively significantly correlated (-.661) with the Alpha Angle for left foot.

The CSI for right foot and left foot are found to be positively significantly correlated with the Staheli Index for right foot (0.949) and Staheli Index for left foot (0.967) respectively.

DISCUSSION AND CONCLUSIONS

The results of the present study are like-minded with the result of Robin et. al. (2007), which showed that Navicular height, is positively correlated with Alpha Angle whereas Navicular height is negatively correlated with Staheli Index and Chipaux-Smirak Index. Thus, we can construe that Staheli Index and Chipaux-Smirak Index are negatively correlated with Alpha Angle, and positively correlated with each other. Results of this study are also compatible with research findings of Roy, et.al. (2012), which acknowledge that the arch-index showed significant negative correlations with standing navicular height analysed in both sexes.

The CSI is the ratio between smallest length of mid-foot and the largest length of the metatarsal heads regions. According to this indexing the five categories are mentioned for the MLA classification. If CSI-0%: foot with elevated arch; 0.1- 29.9%: foot with morphological normal arch; 30-39.9%: intermediate foot; 40-44.9%: foot with lowered arch; 45% or higher flatfoot.

The AA is the angle formed between the line that joins the most medial point of the metatarsal heads region with the apex of the concavity of MLA print and the internal tangent of the plantar print. According to AA, MLA is classified in: 0-29.9° low arch, 30-34.9°dropped arch, 35- 41.9°intermediate, 42-46.9° normal arch; above 47°, elevated arch.

The SI is the ratio between the smallest length of the mid-foot and the largest length of the heel. Value between 0.44 and 0.89 were considered as normal.

The CSI shows that as the value increases the MLA decreases which means that foot continue towards flatfoot and vice-versa, whereas AA represents that as angle value increases, the MLA increases meaning thereby that foot persists towards cavus foot and vice-versa. Therefore CSI and AA assessment methods are negatively correlated. Similarly, foot is considered as normal if SI value ranges between 0.44 – 0.89 and if the value is less than
0.44, foot leads towards cavus foot and if the SI value is more than 0.89, it leads towards flatfoot. As already mentioned AA reflects that as angle value increases, MLA also increases meaning thereby that foot persists towards cavus foot and vice-versa. Thus these two methods CSI and AA are also negatively correlated. But CSI and SI are positively correlated because, as CSI value increases, the MLA value decreases means foot continues towards flatfoot and vice-versa. Similarly, if the value is less than 0.44, foot leads towards cavus foot and vice-versa. And if the SI value is more than 0.89, it leads towards flatfoot.

REFERENCES


COMPARISON OF DIFFERENT PACES OF SURYANAMASKAR ON FLEXIBILITY OF SCHOOL STUDENTS

Dr. Vivek Singh  
Assistant Professor, Lakshmibai National Institute of Physical Education, Gwalior (M.P)

Dr. Anurodh Singh Sisodia  
Associate Professor, Lakshmibai National Institute of Physical Education, Gwalior (M.P)

ABSTRACT

The objectives of the study were to determine the main effect of training durations (within-groups), the main effect of groups (between-groups) and interaction effect (combined effect of training durations and groups) on flexibility due to practices of Suryanamaskar. Mixed design was used for study. Three intact groups were formed and 14 subjects were in each group in the range of 15 – 17 years. First group performed one round of Suryanamaskar in 1 minute, second group in 2 minutes and third group in 4 minutes. Total treatment duration was 12 weeks. Flexibility was measured by Sit and Reach test at pre-test, after 6 weeks and after 12 weeks of all three groups. 3 x 3 mixed factorial ANOVA was used and level of significance was set at 0.05. The findings of the study revealed that practice of Suryanamaskar for 6 weeks and 12 weeks were sufficient to bring out significant improvement on flexibility (main effect of training duration). There was no interaction effect found among groups. There was no significant difference found among groups (main effect of groups).

Key words: Suryanamaskar, Pace, Flexibility and mixed ANOVA.

INTRODUCTION

The Sanskrit name surya is refers to the sun and namaskara means ‘salutations’. 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 (Suryanamaskar) 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).

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).

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 seven asanas. Going through many research papers this query has been raised that change in the pace of Suryanamaskar practice, will effect differentially on the flexibility (Bhavanani, 2011).

The objectives of the study were to determine the main effect of training durations (within-groups), the main effect of groups (between-groups) and interaction effect (combined effect of training durations and groups) on flexibility due to practices of Suryanamaskar.
METHODS

To attain the purpose of the study, forty two male students from class 11th and 12th class were selected as subjects from Kiddy's Corner School, Gwalior. The age of the subjects were ranged between 15 to 17 years. Flexibility of lower back and posterior thigh muscles was measured by Sit and Reach test. The score was expressed in number of centimeters. Three trials were given and the highest score was recorded. Mixed-Model design (between-within group design) was used for the study. For administration feasibility three intact groups were formed, namely group 1, group 2 and group3. 14 subjects were in each group. The data was collected from all the three groups before the training (pre-test), after 6 weeks and after 12 weeks training of Suryanamaskar. First experimental group preformed one round of Suryanamaskar in 1 minute pace, second experimental group in 2 minute pace and third experimental group in 4 minute pace.

Suryanamaskar practice was carried for a period of 12 weeks, five days per week. The scheduled time of practice was during their physical education period for 40-45 minutes. Suryanamaskar practice was demonstrated to the group by the scholar and most important points were reviewed many times. The pace (speed) of Suryanamaskar was control by watch. To determine the effect different paces of Suryanamaskar on Flexibility 3 x 3 between-within factorial ANOVA was applied and level of significant was set at 0.05.

RESULTS

Table 1
Descriptive Statistics of Flexibility of Different Groups and Training Duration of Suryanamaskar

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>S.D</th>
<th>Mean</th>
<th>S.D</th>
<th>Mean</th>
<th>S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pace 1</td>
<td>20.07</td>
<td>2.81</td>
<td>25.07</td>
<td>1.8</td>
<td>27.2</td>
<td>1.89</td>
</tr>
<tr>
<td>Pace 2</td>
<td>20.71</td>
<td>2.73</td>
<td>25.64</td>
<td>1.9</td>
<td>27.6</td>
<td>2.19</td>
</tr>
<tr>
<td>Pace 4</td>
<td>19.85</td>
<td>2.97</td>
<td>26.17</td>
<td>2.55</td>
<td>28.53</td>
<td>1.92</td>
</tr>
</tbody>
</table>

Table 2
Mauchly’s Test of Sphericity for Training Duration of Flexibility

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Mauchly’s W</th>
<th>Approx. Chi-Square</th>
<th>Df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>0.86</td>
<td>5.60</td>
<td>2</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*p-value > 0.05 was significant.

In table 2 Mauchly's test was applied to check the assumption of sphericity. The p-value was 0.06 which is more than 0.05, so we found that the assumption of sphericity has been fulfilled.

Table 3
F- Table for Training Durations (Within-Subjects Effects) and Interaction Effect of Flexibility

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>p-value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>1291.36</td>
<td>2</td>
<td>645.68</td>
<td>374.51</td>
<td>0.00</td>
<td>0.90</td>
</tr>
<tr>
<td>Duration *Groups</td>
<td>13.98</td>
<td>4</td>
<td>3.49</td>
<td>2.02</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>Error(duration)</td>
<td>134.47</td>
<td>78</td>
<td>1.72</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p-value < 0.05 was significant.

Above table shows that there was a significant main effect of training durations on flexibility as the p-value was 0.00 which was less than 0.05. It also showed that there was no significant interaction effect between groups and training durations as the p-value was 0.09 which was greater than 0.05. Partial etasquared in the above table explains 90% of variance of training durations and 9% of variance was explained by the interaction effect, which showed variance of interaction between training durations and groups. Partial eta squared of training duration indicated very large effect size and interaction indicate low effect size.

Table 4
F- Table for Groups (Between-Subjects Effects) of Flexibility

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>p-value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>11.607</td>
<td>2</td>
<td>5.804</td>
<td>0.43</td>
<td>0.65</td>
<td>0.02</td>
</tr>
<tr>
<td>Error</td>
<td>518.863</td>
<td>39</td>
<td>13.304</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p-value < 0.05 was significant.
Above table shows that there was no significant main effect of groups (pace 1, pace 2 and pace 4) on flexibility due to Suryanamaskar practice as the p-value was 0.650 which was greater than 0.05. Partial eta squared in the above table explains 2% of variance of groups, which indicated low effect size.

Table 5
Marginal Means of Flexibility among Training Durations Irrespective of Groups

<table>
<thead>
<tr>
<th>Time</th>
<th>Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>20.21</td>
<td>0.44</td>
</tr>
<tr>
<td>6 weeks</td>
<td>25.63</td>
<td>0.32</td>
</tr>
<tr>
<td>12 weeks</td>
<td>27.83</td>
<td>0.31</td>
</tr>
</tbody>
</table>

*Fig. 1: Graphical Representation of Marginal Means of Flexibility among Training Durations*

From table 3 it is evident that there was a significant main effect of training duration. In order to compare different training durations (i.e. pretest, after 6 and 12 weeks) pairwise comparisons were performed after Bonferroni adjustment. The results are shown in the table 6.

Table 6
Pairwise Comparisons between Training Durations of Flexibility

<table>
<thead>
<tr>
<th>(I) time</th>
<th>(J) time</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>6 weeks</td>
<td>-5.41*</td>
<td>0.31</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>12 weeks</td>
<td>-7.61*</td>
<td>0.30</td>
<td>0.00</td>
</tr>
<tr>
<td>6 weeks</td>
<td>Pretest</td>
<td>5.41*</td>
<td>0.31</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>12 weeks</td>
<td>-2.20*</td>
<td>0.22</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*p-value < 0.05 was significant.

Above table shows that there was a significant difference between pretest - after 6 weeks, pretest - after 12 weeks and after 6 weeks - after 12 weeks as the p-value was less than 0.05.

Graphical representation of flexibility for all the three experimental groups in all the durations of training is shown in figure 2 below:

**DISCUSSION AND CONCLUSIONS**

The stretchability of the muscles is the most common factor limiting the range of movement. By proper training over a period of 4-6 weeks the stretchability of the muscles can be increased to a significant level. (Hardayal. 1991)

It was also concluded that Suryanamaskar practice for 6 and 12 weeks with pace 4 help improve maximum flexibility as compared to pace 1 and pace 2 and control group. Slow stretch and hold method is one of the safe and best method for flexibility improvement. In this method the joint is slowly stretched to the maximum limit and is held there for 3 – 8 seconds before returning to the original position (Hardayal. 1991). This may be the reason that pace 4 group has better flexibility than other groups.

There are some several studies which have shown that the practice of Suryanamaskar improve flexibility (Raja., 2012; Choudhary., 2010).
There were no significant differences found among three groups (main effect of paces) on flexibility at pretest, after 6 and 12 weeks because improvement in flexibility was almost similar after 6 and 12 weeks (interaction effect found insignificant) in all three groups.

REFERENCES


INFLUENCE OF LOADING PHASE ON ATTAINING MAXIMUM HEIGHT DURING BADMINTON SMASH

Dr. Y. S. Rajpoot
Assistant Professor L.N.I.P.E., Gwalior

ABSTRACT
Besides table tennis and tennis, badminton is one of the fastest Olympic racket and net sports in the world. The purpose of the present study was to know the effect of loading phase on attaining maximum height during badminton smash. For the purpose of the study, eighteen [N = 18] professional male badminton players were selected as the subjects. The data was collected in the proper standard procedure and in control condition. The standard instruments and software were used for the study for digitized the biomechanical variables. The vediography technique was employed to record the performance of smash shot. For digitizing the selected variables (loading height and gaining height), the Kinovea 2D motion analysis software was used in the study and product moment correlation coefficient was employed for analysing the data. The results demonstrated the significant relationship between the independent variable (loading height) and dependant variable (gaining height) at 0.05 level of significance. So the findings concluded that positive correlation between these two variables i.e., for achieving the height for a winner smash shot, the players need to positively go down at optimum level to generate or produced the maximum contraction in his legs.

Key Words: Badminton, Smash Shot, Loading Height, Gaining Height, correlation.

INTRODUCTION
In countries which engage in scientific methods in sports area, training period became the main topic of many multifaceted research, observation and applications. As a result of the evaluation of all these studies, training science was born and it has been the most important decisive criterion in the preparation of athletes to the competitions (Sevim, 2006). Badminton is characterized by specific running paths, jumps, and lunges, as well as by the continuous change between accelerated and decelerated movements and jumps. During an entire match, a player covers a distance of approx. 1800-1900 mts. (Liddle et al., 1996). The average match and break time is approx. 6.4 seconds and 12.9 seconds respectively, and the average number of shots is 6.1 per rally (Cabello & Gonzalez-Badillo, 2003). The objective of the forehand overhead smash is a direct winner or the aggressive preparation for a winner. An even higher hitting point can be achieved when performing the shot as Jump Smash, which requires optimum jumping power and jumping height (Tsai & Huang, 1998; Tsai et al., 2000). Relative force is a major factor in achieving the highest possible shuttlecock hitting point. Therefore, maximum strength training, speed training, and various forms of plyometric training - such as jumps, jump sequences, and jump combinations show significant advantages over methods expanding the muscle cross section (Blatter & Noble, 1979; Bobbert, 1990).

Numerous authors describe training effects in terms of jump height improvement through reactive or plyometric training. The present study hereby makes an effort to broaden the horizon of knowledge by bringing new facts by investigating the effect of loading phase on attaining maximum height during badminton smash. So the researcher tested the research hypothesis that there would be significant relationship between loading phase and gaining phase while performing the badminton smash.

METHODS
The methodology of the study consist of selection of subjects, selection of variables, criterion measures, instruments used, testing procedure and the technique employed for analysis of data.
For the purpose of the study, eighteen \[n=18\] male professional badminton players age range from 18 to 25 year old belonging to Lakshmibai National Institute of Physical Education, Gwalior were selected as an experimental group. Their mean height and mean weight and mean value of BMI were 1.69±2.04 mts. and 59.27±7.56 kg. and 20.63±1.86 respectively. All the subjects were national level professional players and having 5 to 7 years of competitive experience. Body Mass Index (BMI), Competitive experience, loading height and gaining height were the variables selected for the study. Stedimetre was used to measure the height of the subjects and unit of measurement was metre. Weight machine was used to measure the weight of the subjects and unit of measurement was kg. A high speed camera was used to video recording of the smash action of the subjects. Kinovea 2D motion analysis software was used to digitise the videos and collection of values of selected variables for different subjects.

Prior to the main experiment, BMI was calculated using the standard formula \[\frac{\text{weight (kg.)}}{\text{height (mts.)}}\] and the subjects were asked about their competitive experience and the answers were recorded as raw data for the variable “experience”. After experiment pretesting, the subjects were recorded using high speed camera while hitting a smash (Figure 1). Later on, by using kinovea 2D motion analysis software the numeric values for selected variables were attained from the videos. To find the two linear variables (loading height and gaining height) three phases of smash jump was considered during analysis. They are: centre of gravity at standing position, centre of gravity at loading phase and centre of gravity at hitting phase. The values of the two variables were calculated using the following formula:

\[\text{Loading Height} = \text{Centre of gravity at standing position-centre of gravity at loading phase.}\]

\[\text{Gaining Height} = \text{Centre of gravity at hitting phase-centre of gravity at standing position.}\]

To find the descriptive statistics and to find the relation; correlation coefficient was calculated by using person product moment method. Level of significance was considered at 0.05 level and all the statistical calculations were calculated by means of SPSS statistical package.

**RESULTS**

The descriptive statistics which was applied in order ascertain the characteristics of the selected variables are presented below:

**Table 1:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index</td>
<td>18</td>
<td>17.70</td>
<td>23.60</td>
<td>20.63</td>
<td>1.86714</td>
</tr>
<tr>
<td>Loading Height</td>
<td>18</td>
<td>0.00</td>
<td>0.25</td>
<td>0.125</td>
<td>0.07056</td>
</tr>
<tr>
<td>Gaining Height</td>
<td>18</td>
<td>0.07</td>
<td>0.51</td>
<td>0.3672</td>
<td>0.10937</td>
</tr>
</tbody>
</table>

As the table 1 presents the descriptive statistics of the variables; it can be seen that maximum and minimum values of BMI are 17.70 and 23.60 respectively whereas mean value is 20.6306 with standard deviation 1.86714. It can also be seen that there is 0.00 minimum lowering of c.g. whereas maximum lowering of cg is 0.25. the mean and standard deviation are 0.1250 and .07056 respectively. In case of gaining height 0.07 and 0.51 are the minimum and maximum value and mean and standard deviation are 0.3672 and 0.10937 respectively.

The coefficient of correlation \(r\) of selected variables independent variable (Loading Height) with Dependent variable (Gaining Height) is presented separately in tables 2:
The table 2 shows the correlation between lowering of c.g. at optimal extent while loading phase and gaining of c.g. at gaining height phase. And the result clearly shows that there is a positive correlation between these two variables i.e. for achieving the height for a winner smash shot.

DISCUSSION AND CONCLUSIONS

The players need to positively go down at optimum level to generate or produced the maximum contraction in his legs. The same results is supported by many other researchers those findings indicate that the higher hitting point can be achieved when performing the shot as Jump Smash, which requires optimum jumping power and jumping height (Tsai & Huang, 1998; Tsai et al., 2000). The higher the athlete hits the shuttlecock – i.e., indirectly, the higher the height of the jump – the steeper the trajectory and the shorter the path of the shuttlecock. This enables the player to optimize the utilization of the court size (Rambely et al., 2005). The study done by Frohlich et. al. in 2014 also supported the present study as mentioned that Since most exercises, jumps, or jump sequences of the training intervention did not require any swing movement – the actual jump was executed mostly from a concentric movement with a knee angle of more than 90 degrees – a high degree of congruence between dynamic training exercise and test modality can be assumed for the smash shot where a player need to take a good squat jump.

The results of this study point to the conclusion that there was a positive correlation between these two variables i.e. for achieving the height for a winner smash shot, the players need to positively go down at optimum level to generate or produced the maximum contraction in his legs. Even though maximum jump height are not explicitly required in performance-oriented badminton, there are still implicit influences of jumping power and jump height on badminton-specific hitting techniques, such as smashes and on badminton-specific running techniques (Frohlich et. al., 2014).

REFERENCES

Guidelines for Sending Manuscript

1. Paper title, name(s) of the author(s) and address for correspondence should be placed on a separate sheet. The first page of manuscript should include the title only. Author(s) of the manuscripts must send an undertaking that the said manuscript has neither been sent to any other journal or to any other publisher.

2. Manuscripts submitted to IJPESMES should be divided into the following sections:
   a. Title page
   b. Abstract
   c. Introduction
   d. Methods
   e. Results
   f. Discussion of Findings
   g. Conclusions
   h. References
   i. Tables with captions
   j. Figure Legends (if applicable)

3. Manuscripts should preferably should not be more than 4000 words including abstract. It must typed in MS Word, New Times Roman font in 12 points font size with 1.5 space.

4. Only soft copy of Manuscripts will be accepted send through mail. Official email ID for sending manuscript for this journal through editor is lnipejournal@gmail.com.

5. Too much long Table and figures should be avoided, Please also include them separately a part from manuscript. Heading of tables should be numbered by Roman numerals and figures by Arabic numerals.

6. Manuscript must be accompanied by declaration signed by author(s) to the effect that the research paper/article has not been published elsewhere or is not under consideration for publication elsewhere and that it is submitted exclusively to this Journal.

7. Bibliographical references should be arranged alphabetically and should be given at the end of text as per American Psychological Association (APA) reference style strictly.

8. Research papers not accepted will not be returned.
SUBSCRIPTION FORM

I wish to subscribe the Indian Journal of Physical Education, Sports Medicine and Exercise Science. Kindly find the demand draft in the name of Registrar, LNIPE, Gwalior (M.P.) India as per the below mention request.

Name of Individual/Institute: .............................................................................................................................................

Organization: ..............................................................................................................................................................

Address: ..............................................................................................................................................................

Email: ..............................................................................................................................................................

Telephone: (O)............................................................................ (R) ............................................................................................

Mobile: ..............................................................................................................................................................

Subscription Rates:

<table>
<thead>
<tr>
<th>Duration</th>
<th>INDIVIDUAL (Rupees)</th>
<th>INSTITUTIONAL (Rupees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students</td>
<td>Others</td>
</tr>
<tr>
<td>One Year</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Five Years</td>
<td>800</td>
<td>2,000</td>
</tr>
<tr>
<td>Life Time (10 years)</td>
<td>1,500</td>
<td>3,500</td>
</tr>
</tbody>
</table>

Please mention type of subscription: ...........................................................................................................................

Amount in words: ..........................................................................................................................................................

Date: ............................................................ Name and Signature: ............................................................

(Xerox copy of this form is also acceptable)
Note

The Indian Journal of Physical Education Sports Medicine & Exercise Science is published Bi-Annually by Lakshmibai National University of Physical Education, Gwalior (M.P.)

The University is not responsible for the statements made or opinions expressed by the authors in this Journal.

All communications regarding papers should be addressed to Prof. (Dr.) G.D. Ghai and regarding subscription to

Editor
Lakshmibai National Institute of Physical Education
Shakti Nagar
Race Course Road
Gwalior-474 002. (M.P.) India.
Phone  : 91-751-4000902
Fax    : 91-751-4000992
E-mail : lnipejournal@gmail.com
website : www.lnupe.gov.in
WORLD- WIDE DISTRIBUTION OF JOURNAL BY

S. Karger & Other
S. Karger Publishers Inc. 26, West, Avon Road,
P.O. Box 529, Farmingtan CT, U.S.A

Book Center Inc.
1140 Beaulac Street, Montreal, Quebec H4R 1 RB, CANADA

LibrairieLuginbuhl,
36, Boulevard de Latour, Mauboug F-75007, Paris, FRANCE

Katakura Libri, Inc.,
36-9 Hongo 3 Chome, Bunkyo Ku, Tokyo 113, JAPAN

S. Karger Publishers
1. Torberry Drive Petersfield, Hampshire Gu 314 HW, GREAT BRITAIN

Tappan Co. (s) Pvt. Ltd.,
38, Liu Fang, Road, Jurong Town, SINGAPORE – 2262

Karger, Suk & Fee Ltd.
90/20 Rajaprarob Road Makkasan, Bangkok 10400, THAILAND

S. Karger India
8-5/1, 32 Safderjang Enclave, New Delhi 110029 (India)

WORLD- WIDE INDEXING & DOCUMENTATION

The articles published in this journal are indexed & documented in many leading information Centres; Indexing Journals, such as:

Library Manuel Bandeira
Centroo Education DE Realengo, BRAZIL

Physical Education Index, U.S.A.,
SPOLIT Bundesinstitut for Sportwissenschaft, FRG

International Association of Sports Information
NETHERLANDS, ERIC

ARC Professional Service Group Information System
U.S.A.

Sports Documentation Monthly
Bulletin University of Birmingham, ENGLAN

SistemaBrasileiro DE Documentacao&InformacaoDesportive
BRAZIL
### Form IV
(See Rule 8)

<table>
<thead>
<tr>
<th>1. Place of Publication</th>
<th>: Gwalior</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Periodicity of its Publication</td>
<td>: Bi-Annual</td>
</tr>
<tr>
<td>3. Printer’s Name</td>
<td>: Suneel Bansal</td>
</tr>
<tr>
<td>(Whether citizen of India)</td>
<td>: Yes</td>
</tr>
<tr>
<td>(If foreigner, state country of origin)</td>
<td>: Welcome Offset Printers Lohiya Bazar, Lashkar, Gwalior</td>
</tr>
<tr>
<td>Address</td>
<td>:</td>
</tr>
<tr>
<td>4. Editor’s Name</td>
<td>: Prof. (Dr.) G.D. Ghai</td>
</tr>
<tr>
<td>(Whether citizen of India)</td>
<td>: Yes</td>
</tr>
<tr>
<td>(If foreigner, state country of origin)</td>
<td>:</td>
</tr>
<tr>
<td>Address</td>
<td>: Lakshmibai National Institute of Physical Education, Shakti Nagar, Gwalior - 474 002 M.P. (INDIA)</td>
</tr>
<tr>
<td>5. Chief Editor’s Name</td>
<td>: Prof. (Dr.) Vivek Pandey</td>
</tr>
<tr>
<td>(Whether citizen of India)</td>
<td>: Yes</td>
</tr>
<tr>
<td>(If foreigner, state country of origin)</td>
<td>: 79, Lakshmibai National Institute of Physical Education Shakti Nagar, Gwalior - 474 002 M.P.</td>
</tr>
<tr>
<td>Address</td>
<td>:</td>
</tr>
<tr>
<td>6. Name and addresses of individuals</td>
<td>: Lakshmibai National Institute of Physical Education Shaktinagar, Gwalior - 474 002 M.P.</td>
</tr>
<tr>
<td>(If foreigner, state country of origin)</td>
<td>:</td>
</tr>
<tr>
<td>Address</td>
<td>:</td>
</tr>
</tbody>
</table>

I Dr. G.D. Ghai hereby declare that the particulars mentioned above are true to the best of my knowledge.

January & July, 2016
Volume 16, (Issue 1&2)