Comparison of Simple Reaction Time between Volleyball and Football Playing Collegiate Athletes

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ABSTRACT

Context: The importance of reaction time in sports is to develop fine motor skills for athletes in specific movements; this improves as a result of extensive practice of those concerned movements in athletic events. Reaction time is crucial as per the demand of the sports and for the prevention of sports related injuries. Thus, evaluation of reaction time and emphasizing the importance of its evaluation is required as it guides to train them accordingly.

Aim: To determine the differences in the reaction time of Volleyball playing and Football playing collegiate athletes

Settings and design: Study setting was Pravara institute of medical sciences (DU) & Study design was cross-sectional comparative study.

Materials and Methods: The study involved 60 collegiate athletes between the age group of 18-25 years from PIMS (DU). The participants were assessed for the Simple reaction time. By using Ruler drop method. Material used was Wooden Ruler.

Statistical analysis used: Mean & SD were used for descriptive statistics and unpaired t test was used for comparison of data between both the groups. Data analysis were done on SPSS v. 20.00

Result: The mean and standard deviation of group A (Volleyball playing collegiate athletes) and Group B (Football Playing collegiate athletes) was 0.22±0.02 and 0.18±0.02 respectively. The t value between both the groups was 7.75.

Conclusion: After comparing two groups (A&B) it was concluded that Group B has reduced reaction time than Group A. Football playing collegiate athletes has faster reaction time than volleyball playing collegiate athletes.

Keywords: reaction time, ruler drop method, volleyball players, football players, collegiate athletes

INTRODUCTION

Reaction time is the time phase between the applications of a stimulus and the appearance of appropriate voluntary response by a subject as quickly as possible. It is a measure of function of sensorimotor association and performance of an individual. It involves stimulus processing, decision making and response programming. [¹]

Reaction time involves the central nervous system recognizing a stimulus and then directing the muscles to take some kind of action. Sensory neurons detect a stimulus. Additional neurons transmit the message about the stimulus to the brain or spinal cord, which interprets the information and decides on some type of action. A message is then carried back to motor neuron cells. Motor neuron cells direct the muscles to carry out the response. All of this activity within nervous system happens in a fraction of a second. That fraction of a second is measured as reaction time. [²]

Time require to respond visual stimuli is known as ‘Visual Reaction Time (VRT)’. Reaction time becomes an important of information processing as it indexes speed
of stimulus processing and response programming. [3]
Luce and Welford [4-5] described three types
of reaction time.
1) Simple reaction time: there is one
stimulus and one response.
2) Recognition reaction time: stimulus that
should be responded to and other that
should not get a response.
3) Choice reaction time: there are multiple
stimulus and multiple responses.
By the practice of motor movements,
muscular coordination and speed of
movement can be improved which would
improve movement time. Long lasting
improvement in performing skilled motor
movements can be achieved by training and
retraining and repeated practicing. [6-8]

It is a measure how quickly an
organism can respond to a particular
stimulus. Lesser the reaction time it
multiplies one’s achievements in many
areas such as, sports, academics, music,
dance, driving, defense etc. By identifying
the person’s reaction time, we can predict
reacting abilities in the above-mentioned
situation.

The importance of reaction time in
sports is to develop fine motor skills for
athletes in specific movements; this
improves as a result of extensive practice of
those concerned movements in athletic
events. Rapid reaction time in athletes could
be due to improved concentration and
alertness, better muscular coordination, and
improved performance in speed and precise
tasks. [6]

Quick reaction is helpful in sports
such as football, basketball, and tennis. [4]
Several studies have found that adherence to
a regular exercise program can improve
muscle strength and this helps to a
significant improvement in reaction time.
Impairment in muscle strength, stability,
and balance alters the reaction [7]

**MATERIALS AND METHODS**
Ethical clearance was obtained from
Institutional Ethical Committee of Dr.
A.P.J. Abdul Kalam College of
Physiotherapy, PIMS-DU. A total 100
participants based on inclusion criteria and
exclusion criteria was selected. The
collegiate athletes of age group from 18 to
25 years old, collegiate athletes who have
played volleyball and football at university
or higher level and subjects willing to
submit written informed consent form were
included in this study. Any type of acute
injury or trauma like open wounds,
fractures, nerve injury related to upper limb
causing physical changes and pain which
can affect reaction time, and athlete who are
on irregular practice of sports more than 2-3
months were excluded for this study. The
participants were selected randomly from
Pravara Institute of Medical Sciences
voluntarily.

After taking written informed
consent form all the 100 participants, only
60 participants were randomly selected for
further participation in this study. All these
60 participants were divided randomly in to
two equal groups of 30 each. Group A
consists of 30 participants of Volleyball
players and group B consists of 30
participants of Football players.

The simple reaction time of each
participant was assessed by using ruler drop
method. The test was done in a cool and
calm laboratory setup during morning
session with room temperature maintaining
at 25°C. All participants were instructed not
to involve in any physical exertion activity
at least 2 hours prior to the test.

To measure reaction time by ruler
drop test, the subject is made to sit with
their dominant side elbow flexed at 90
degrees with mid-pronated forearm resting
on a flat horizontal table surface, with the
open hand at the edge of the table; Then
ruler is suspended vertically by the
examiner, such that 5 cm graduations of the
ruler were aligned between the web sparce
(space between thumb and index finger)
of the subject’s hand. Then the subject is
asked to catch the ruler once it was released
from the examiner’s hand.
Then distance is converted into time by
using following formula:
\[ t = (2d/g)^{1/2} \]

Here \( t \) = reaction time; \( d \) = distance travelled by the ruler and \( g = 9.81 \text{m/s}^2 \) (gravitational constant). Three trials will be taken and their mean is taken into analysis. 

**RESULTS**

The mean and standard deviation of group A (Volleyball playing collegiate athletes) and Group B (Football Playing collegiate athletes) was 0.22±0.02 and 0.18±0.02 respectively as shown in table 1.

**Table 1: Demographic table**

<table>
<thead>
<tr>
<th>GROUP A</th>
<th>GROUP B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>No. of participants</td>
<td>06</td>
</tr>
<tr>
<td>Age</td>
<td>20.83±1.94</td>
</tr>
<tr>
<td>Height</td>
<td>174.17±9.99</td>
</tr>
<tr>
<td>Weight</td>
<td>67.33±10.31</td>
</tr>
<tr>
<td>BMI</td>
<td>22.45±1.92</td>
</tr>
</tbody>
</table>

Students Unpaired ‘t’ test was applied for simple reaction time between both groups. The t value was 7.75 as shown in table 2.

**Table 2: Mean reaction time of Group A and Group B and value of t test**

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>A</th>
<th>B</th>
<th>p value</th>
<th>t value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN ± STANDARD DEVIATION</td>
<td>0.22±0.02</td>
<td>0.18±0.02</td>
<td>&lt; 0.001</td>
<td>7.75</td>
<td>Highly Significant</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Reaction time is important in sports to develop fine motor skills for athletes in specific movements; this improves as a result of extensive practice of those coordinated movements in athletic events. Speedy reaction is helpful in sports such as football, basketball, volleyball, tennis etc. several studies have found that adherence to a regular exercise program can improve muscle strength and this helps to a significant improvement in reaction time. In previous studies Aranha et al. has performed ruler drop method in typically developed children’s [10] and Anitha et al [11] has performed ruler drop method to estimate reaction time in sitting and standing posture among typical young adults. But not many studies were conducted in athletes with the use of assessment tool such as Ruler Drop Method.

In this study ruler drop method was used to find out reaction time in athletes (In two different sports playing collegiate athletes) to find which sports gives reduced reaction time i.e. good reaction time than other. The aim of the study was to determine the differences and correlation of reaction time in athletes. Analysis of the results shows that those practice football had shorter reaction time when compared with volley ball players. The difference between reaction time values was statistically significant. (The mean and standard deviation of group A: Volleyball players were 0.22±0.02, and in Group B: Football Players were 0.18±0.02. There is significant difference between mean reaction time.

In relation to gender observation in this study, Group B Where in respect to sex ratio, male ratio is more than female ratio (There were 6 Males in Group A (Volleyball playing collegiate athletes) and 20 Males in Group B (Football playing collegiate athletes), whereas 24 Females in Group A and 10 Females in Group B. due to unequal sex ratio, as Group B has more males these can lead to reduced reaction time in Group B Than A. These observations also support the study done by Balasubramanian et al., where males showed faster RTs than Females [12] Some of the reasons stated by previous authors were the varying level of sex steroids modifying the axonal conduction affecting the sensory
motor association with processing speed at the central nervous system.\[13\]

Clinical implication through this study suggests that Ruler drop method is Reliable clinical measure use for assessment of reaction time in collegiate athletes. Further research with respect to different sports and on patients with specific condition should be conducted. RDM can be used as Clinical evaluation tool.

CONCLUSION

After comparing two groups (A&B) it was concluded that group B (Football playing collegiate athletes) has reduced reaction time than group A (Volleyball playing collegiate athletes)

Football playing collegiate athletes has faster reaction time than volleyball playing collegiate athletes

Conflict of Interest: No conflict of Interest.

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