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A Comparison in calf and groin muscle flexibility between gymnasts and yogis

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Abstract
Purpose: The purpose of the study was to compare the difference in calf and groin muscle flexibility between gymnasts and yogis.
Method: A total of 60 boys (aged 10-14 years) were selected for the present study which had an equal no. of subjects from gymnastics and yoga. All the subjects had participated in state-level championships. The calf muscle flexibility and groin muscle flexibility were compared between these two groups. To measure the calf muscle flexibility and the groin muscle flexibility of the subjects, the calf muscle flexibility test, and groin muscle flexibility test was conducted. In the statistical procedure, mean and standard deviation (S.D.) were used. To analyze the significant difference, a statistical t-test was applied in SPSS 20.
Result: From the present study, it was found that the mean and S.D. of the calf muscle flexibility between gymnasts and yogis were 15.22 & 16.00 and ±3.67 & ±2.57 respectively, and the mean and S.D. of the groin flexibility between gymnasts and yogis were 2.47 & 2.98 and ±2.83 & ±3.46 respectively. The t-value for calf and groin flexibility were found 0.430 and 0.535 respectively.
Conclusion: There was no significant difference found in calf muscle flexibility and groin muscle flexibility between state-level gymnasts and yogis.

Keywords: calf muscle flexibility, flexibility, groin muscle flexibility, gymnastics, state level championship, yoga

Introduction

The concept of physical fitness is an elusive term that is difficult to achieve. Health-related and performance-related fitness has been studied extensively over the past several decades and it has been classified by experts as an aspect of physical fitness [1, 2]. Flexibility is a component of health-related physical fitness. It is one of the major factors in sports, more precisely in gymnastics and yoga. Competitive attitudes both in gymnastics and yoga have had a big impact on it. Due to this, hyper-extensive mobility exercises of the joints are given to them, where flexibility in the various joints plays a vital role to execute the performance smoothly and can avoid injury [3]. The calf muscle is one of the most important lower limb muscles. It consists of two muscles; the gastrocnemius muscle forms the superficial part, and the soleus muscle is located underneath that is attached to the calcaneal tendon [4]. The flexibility of the calf muscle is highly important for gymnasts as well as for yogis. It stimulates blood flow in the muscles, relieves muscle soreness, increases their jumping ability, helps them to land perfectly, and controls the body while in motion, helps to stay perfect at the final posture of some specific yogic activities or specific movements in gymnastics. Raising the heel is a major part of any movement. Dorsi flexion and plantar flexion of the foot are inter-connected with the activation of calf muscles [5]. Therefore, calf muscle flexibility is of high importance. It plays a major role in ankle range of motion during the normal gait cycle, especially in the stride and push-off phases. Tightness restricts the movements which may lead to various injuries or reduce the efficiency of the task [6, 7]. On the other side, groin muscle flexibility is also important in sports. It consists of three groups of muscles, these are the abdominal, iliopsoas, and adductor muscle groups which lead to adducting the thigh and stabilizing the lower extremity. According to Morelli and Smith [8], groin injuries account for 2–5% of all sports injuries [9]. Split (either in front split or side split) is the position that is performed very smoothly both in gymnastics and yoga. In yoga, the side split is called Vibhaktasana and the front split is known as Hanumanasana. In this posture, the angle between the two legs exceeds 180°. In competition, the angle between legs is seen more than 180° many times. So, the present authors intended to study the flexibility of the calf and groin muscles. And the study was set to compare the difference in calf and groin muscle flexibility between gymnasts and yogis.

Objectives

The objectives of the study were as follows:
1. To observe the calf flexibility between gymnasts and yogis.
2. To observe the flexibility of the groin between gymnasts and yogis.
3. To compare the calf and groin flexibility between gymnasts and yogis.

Hypothesis

It was hypothesized that-

H_o^1: There would be no significant difference in calf muscle flexibility between gymnasts and yogis.

H_o^2: There would be no significant difference in groin flexibility between gymnasts and yogis.

Method

Selection of the subjects

A total no. of sixty (n=60) boys were selected, who have participated in state-level gymnastics and yogasana championships at Hooghly district in West Bengal, India. Among these sixty, thirty (n=30) were gymnasts and another thirty (n=30) were yogis. The age of the subjects ranged from 10-14 years. Calf flexibility and groin flexibility were measured by the Calf muscle flexibility test and Groin muscle flexibility test respectively (10).

Selection of parameters

Based on the literature reviewed and discussion with experts, the authors had chosen the following parameters for the study. These were as- calf muscle flexibility and groin muscle flexibility.

Sampling method

To select the subjects, a purposive sampling technique was adopted for this study, and these 60 subjects were selected from Hooghly district, West Bengal.

Design of the study

The purpose of the study was to compare the difference in the calf and groin flexibility between state-level gymnasts and yogis. Due to that, t-test was applied to establish whether they have any difference among the groups mentioned above.

Statistical procedure

In descriptive statistics, mean and standard deviation were used. To analyze the significant difference, a statistical t-test was applied in SPSS 20.

Results and Discussion

Table 1: shows the difference in calf muscle flexibility between gymnasts and yogis.

Groups	N	Mean	Std. Deviation	SEM	t-value
Gymnasts	30	15.22	± 3.67	0.671	.430
Yogis	30	16.00	± 2.57	0.470	

$t_{0.05}^{58}$= 2.009

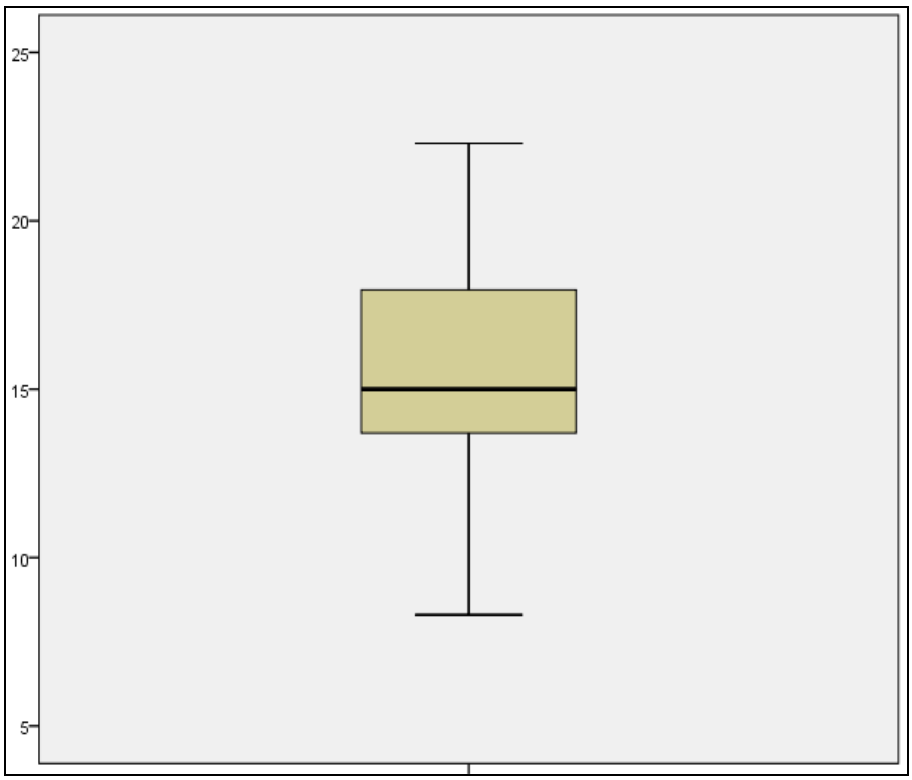
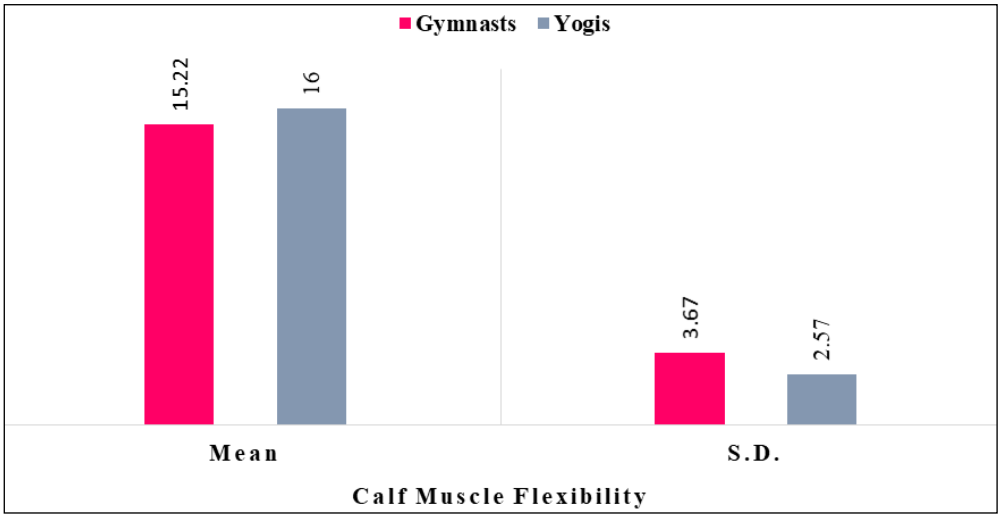


Fig 1: shows the outliers of calf muscle flexibility

Table 1 depicts that the mean and S.D. of the calf muscle flexibility of state-level gymnasts and yogis were 15.22 & 16.00 and ±3.67 & ±2.57 respectively. From the above data, the t-value was found 0.430 at the 0.05% level of significance. It is evident that the calculated value of 't' is smaller than the critical value i.e., 0.430<2.009. As no outlier was found, all data were taken into account for calculation (Figure 1). From the calculated value, it can be said that there was no significant difference in calf muscle flexibility between state-level gymnasts and yogis. A graphical presentation has been shown in graph 1.



Graph 1: shows the graphical presentation of calf muscle flexibility

Table 2: shows the difference in groin flexibility between gymnasts and yogis.

Groups	N	Mean	Std. Deviation	SEM	t-value
Gymnasts	29	2.47	± 2.83	0.525	.535
Yogis	29	2.98	± 3.46	0.642	

$t_{0.05}^{56}$= 2.009

From the table-2, it was noticed that the mean and S.D. of the groin flexibility between gymnasts and yogis were 2.47 & 2.98 and ±2.83 & ±3.46 respectively. From the above data, the t-value was 0.535 at the 0.05% significance level. It is evident that the calculated value of 't' is smaller than the critical value i.e., 0.535<2.009. So, it can be assessed that there was no significant difference in groin flexibility between gymnasts and yogis.

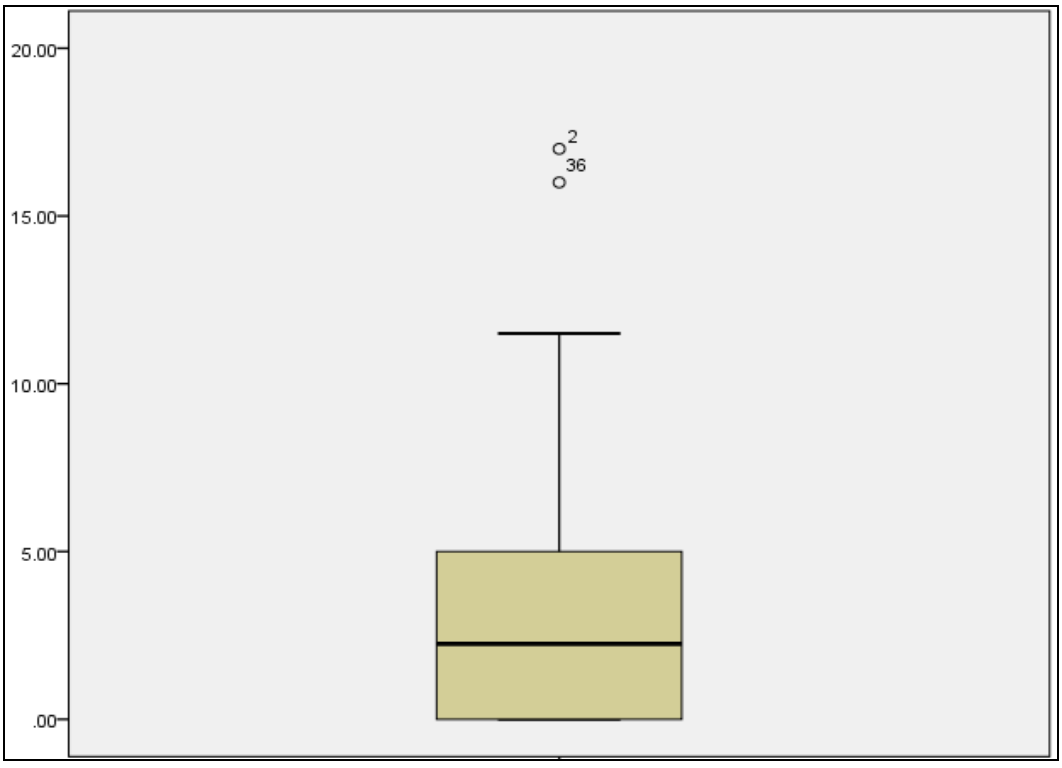
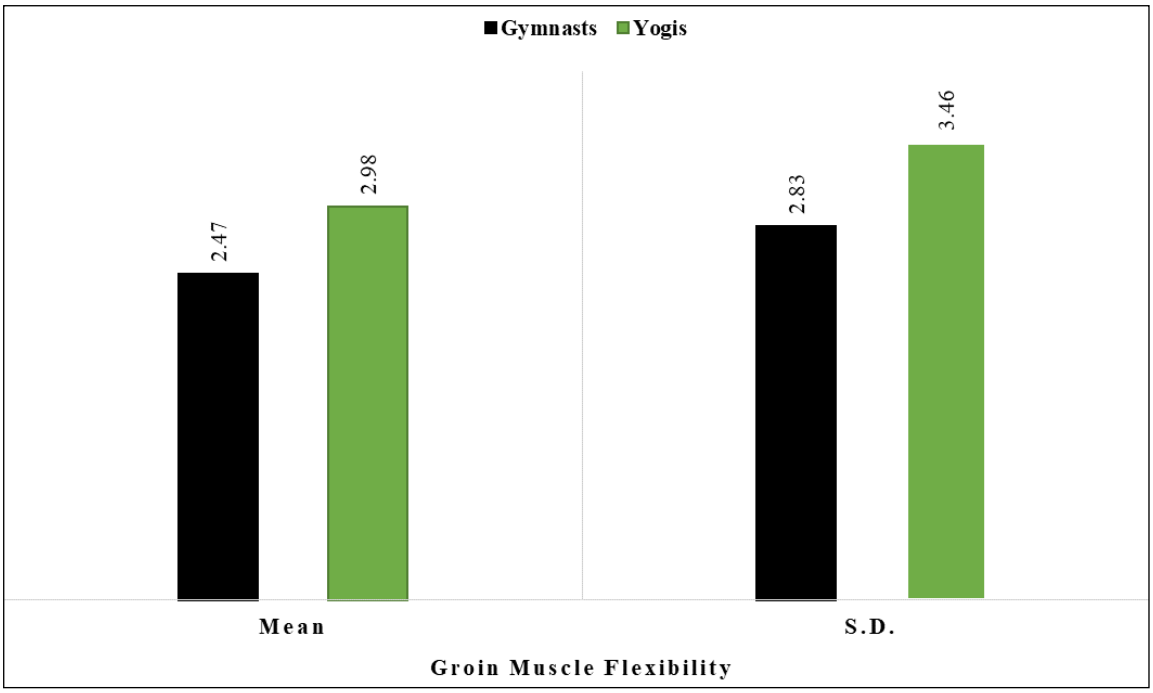


Fig 2: shows the outliers of groin muscle flexibility

Table 3: shows the norms of groin flexibility

Groin Flexibility Test Norms				
Poor	**Fair**	**Good**	**Very good**	**Excellent**
>25cm	=<20cm	=<15cm	=<10cm	=<5cm

A graphical presentation has been shown in graph 2.



Graph 2: shows the graphical representation of groin muscle flexibility

In the present study, the flexibility of the calf and groin muscles were studied, investigated, and compared between state-level gymnasts and yogis. A no. of research has been conducted on calf muscles and groin muscles in different aspects, but very least no. of research had been conducted on calf and groin among gymnasts and yogis. The specialty of this study was to observe and compare the calf and groin flexibility among them. In this study, two (n=2) data of the subjects, one (n=1) from gymnasts and one (n=1) from yogis were found extremely different, which been shown in figure 2 as outliers. Finally, groin flexibility had been analyzed with 58 subjects. Although these 2 subjects participated in state-level championships, they had some injuries and health-related issues. Due to that, they couldn't perform well on the test. So that their data were considered outliers.

When a yogi performs an advanced split posture, excellent groin flexibility is needed to perform it. Sidewise, excellent calf flexibility helps to execute the posture perfectly at the final stage by the plantar flexion of the toes. The same things happen in gymnastics also. Having enough flexibility in the joints indicates good balance and control over the body and mind [10]. As both sports need around the same degree of flexibility in the concerned joints, and all the subjects had participated in state-level championships, they had enough degree of flexibility in the joints. That is why no significant difference was found in both calf and groin muscle flexibility.

Conclusion

Based on the present investigation and comparison between both groups with the existing limitations of the study, the following conclusions were drawn:

1. There was no significant difference in calf muscle flexibility between state-level gymnasts and yogis.
2. There was no significant difference in groin muscle flexibility between state-level gymnasts and yogis.

Conflict of interest

The authors declare no conflict of interest.

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