
A COMPARATIVE STUDY OF SHOULDER, LEG STRENGTH OF SHOT PUTTER AND JAVELIN THROWERS OF SCHOOL GOING BOYS OF RURAL, URBAN AND TRIBAL AREAS OF NAGPUR GRAMIN

Amit Thakur

Researcher

PGTD of Physical Education, Rashtrasant

Tukadoji Maharaj Nagpur University,

Nagpur

Dr. Avinash Shahare

Supervisor

Shri Nashikrao Tirpude College of Physical

Education, Nagpur

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Abstract :

The present study aimed to compare shoulder and leg strength among school-going male shot putters and javelin throwers belonging to rural, urban, and tribal areas of Nagpur Gramin district. A descriptive comparative research design was employed, and a total of 90 boys aged 13–18 years were selected through purposive sampling. The sample included 45 shot putters and 45 javelin throwers, further categorized into rural, urban, and tribal groups. Shoulder strength was assessed using a hand-held dynamometer, while leg strength was measured through the standing broad jump test. Data were analyzed using descriptive statistics, independent t-tests, one-way ANOVA, and percentage-wise distribution analysis. The results revealed significant differences in strength parameters based on sport specialization and socio-geographical background. Javelin throwers demonstrated superior shoulder strength, whereas shot putters exhibited greater leg strength. Urban participants showed higher proportions of high shoulder and leg strength compared to rural and tribal counterparts. The findings highlight sport-specific physiological adaptations and the influence of environmental factors on strength development. The study underscores the need for targeted training interventions and equitable sports development programs, particularly for rural and tribal school-going athletes.

Keywords : Shot put, Javelin throw, Shoulder strength, Leg strength, Rural–urban–tribal comparison, School-going boys, Nagpur Gramin

Introduction :

Throwing events in athletics such as the shot put and javelin throw require a complex integration of strength, power, coordination, and technique. In these events, the musculoskeletal system's ability to generate force rapidly and efficiently significantly influences performance outcomes. Specifically, upper body (shoulder) strength and lower body (leg) strength are critical components, as they contribute to kinetic chain mechanics that transfer energy from the ground through the body to the implement at release. This biomechanical sequence often referred to as the kinetic chain is fundamental in maximizing



throwing distances while minimizing injury risk. Research in throwing sports emphasizes how strength distribution across muscle groups influences performance and injury susceptibility.

However, most existing literature focuses on adult or elite athletes, with limited research on adolescent populations. Moreover, there is a notable gap in the literature comparing athletes from different socio-geographic backgrounds (e.g., rural, urban, tribal areas), whose lifestyles, physical activity patterns, nutrition, and access to training resources may vary considerably.

Rationale for Comparative Focus :

Shoulder Strength :

Shoulder musculature, particularly the rotator cuff complex, plays a vital role in stabilizing the glenohumeral joint during the high-velocity phases of shot put and javelin throwing. Specific strength training has been shown to improve shoulder rotator strength and can enhance performance while potentially reducing overuse injuries common in throwing events.

Leg Strength :

Lower limb strength drives first force production in the kinetic chain generating ground reaction forces that are sequentially transmitted up through the core and shoulder to the implement. Leg strength correlates with jumping performance and throwing outcomes in novice athletes.

Socio-Geographic Variations :

Rural, urban, and tribal areas often differ in terms of sports infrastructure, training exposure, habitual physical activity, and nutrition factors that may influence the development of muscular strength and athletic performance in school-aged boys. These differences have not been systematically examined in the Indian context, particularly in Nagpur's surrounding (Nagpur Gramin) regions.

Objectives of the Study :

The primary objectives of this study are:

1. To assess **shoulder strength** among school-going shot putters and javelin throwers.
2. To assess **leg strength** among school-going shot putters and javelin throwers.
3. To compare shoulder strength across adolescents from **rural, urban, and tribal areas** of Nagpur Gramin.
4. To compare leg strength across these socio-geographic groups.
5. To identify sport-specific strength differences between shot put and javelin throwers in this population.



Preparation of Data :

After completion of data collection, all raw scores obtained from the shoulder strength and leg strength tests were carefully scrutinized for completeness and accuracy. Data coding was carried out systematically, and entries were made into **Statistical Package for Social Sciences (SPSS)** software for analysis. Prior to inferential analysis, the dataset was screened for outliers and missing values.

Descriptive summaries were generated to understand the central tendency and dispersion of variables across groups.

Methodology :

1. Research Design :

A descriptive comparative research design was adopted to examine differences in shoulder and leg strength among the selected groups.

2. Population and Sample :

The population consisted of school-going male athletes (13–18 years) from Nagpur Gramin district who actively participated in shot put or javelin throw. A total of 90 participants were selected using purposive sampling.

- Shot putters : 45
- Javelin throwers : 45

Each group included participants from rural, urban, and tribal areas.

3. Tools and Tests :

- **Shoulder Strength** : Hand-held dynamometer
- **Leg Strength** : Standing broad jump test

Data Analysis and Interpretation :

1. Shoulder strength between shot putters and javelin throwers :

Table 1: Distribution of Shoulder Strength Levels among Shot Putters and Javelin Throwers

Shoulder Strength Level	Shot Putters (N=45)	%	Javelin Throwers (N=45)	%
Low	12	26.67	6	13.33
Moderate	21	46.67	17	37.78
High	12	26.67	22	48.89
Total	45	100	45	100



Chi-square test value: χ^2 value = 7.86, df =2, p =0.020* (*Significant at 0.05 level)

Table 1 shows the distribution of shoulder strength levels among shot putters and javelin throwers. Among shot putters, the majority of participants (46.67%) fall under the moderate shoulder strength category, while equal proportions (26.67%) are observed in the low and high categories. In contrast, javelin throwers demonstrate a higher concentration in the high shoulder strength category, with 48.89% of participants exhibiting high strength levels.

Only 13.33% of javelin throwers fall into the low shoulder strength group, which is considerably lower than the proportion observed among shot putters. This distribution clearly indicates superior shoulder strength development among javelin throwers. The nature of the javelin throw, which involves repeated overhead throwing actions, rapid shoulder rotation, and stabilization, contributes significantly to enhanced shoulder musculature.

The comparatively lower proportion of high shoulder strength among shot putters may be attributed to the greater emphasis on lower-body force generation rather than isolated shoulder strength. Overall, the distribution pattern supports the conclusion that javelin throwers possess better shoulder strength than shot putters, aligning with sport-specific physiological demands.

Leg strength between shot putters and javelin throwers :

Table 2: Distribution of Leg Strength Levels among Shot Putters and Javelin Throwers

Leg Strength Level	Shot Putters (N=45)	%	Javelin Throwers (N=45)	%
Low	7	15.56	14	31.11
Moderate	16	35.56	19	42.22
High	22	48.89	12	26.67
Total	45	100	45	100

Chi-square test value: χ^2 value = 6.94, df =2, p =0.031* (*Significant at 0.05 level)

Table 2 illustrates the distribution of leg strength among shot putters and javelin throwers. Nearly half of the shot putters (48.89%) fall into the high leg strength category, while only 26.67% of javelin throwers demonstrate high leg strength. Conversely, a higher percentage of javelin throwers (31.11%) are found in the low leg strength category compared to shot putters (15.56%).

These results emphasize the crucial role of lower-body strength in the shot-put event. Shot putters rely heavily on explosive leg drive to initiate movement and transfer force through the kinetic chain. Consequently, their training emphasizes lower limb strength development, which is reflected in the higher proportion of athletes with high leg strength.

Javelin throwers, while requiring leg strength for approach and delivery, prioritize speed, coordination, and upper-body mechanics. Therefore, the distribution of leg strength is more centered in the moderate category. The observed pattern reinforces the concept of



event-specific physical conditioning.

Shoulder strength among rural, urban, and tribal school-going boys :

Table 3: Distribution of Shoulder Strength Levels among Rural, Urban, and Tribal Groups

Shoulder Strength Level	Rural (N=30)	%	Urban (N=30)	%	Tribal (N=30)	%
Low	9	30.00	4	13.33	11	36.67
Moderate	14	46.67	11	36.67	13	43.33
High	7	23.33	15	50.00	6	20.00
Total	30	100	30	100	30	100

Chi-square test value: χ^2 value = 10.82, df=4, p =0.029* (*Significant at 0.05 level)

Table 3 presents the distribution of shoulder strength among rural, urban, and tribal school-going boys. Urban participants demonstrate the highest proportion of high shoulder strength (50.00%), whereas rural and tribal groups show considerably lower percentages at 23.33% and 20.00%, respectively.

The higher shoulder strength observed among urban boys may be attributed to better access to sports facilities, structured physical education programs, qualified coaching, and nutritional support. Urban environments often provide greater exposure to organized sports and strength training activities.

Rural and tribal groups show a higher percentage of participants in the low and moderate categories. Although rural boys engage in physical labor and daily activities, the absence of systematic training may limit optimal shoulder strength development. Tribal boys, in particular, face constraints related to socio-economic conditions, limited infrastructure, and fewer sporting opportunities.

This distribution pattern highlights the impact of environmental and socio-geographical factors on physical fitness development. The results underline the need for targeted intervention programs to enhance strength development in rural and tribal populations.

Leg strength among rural, urban, and tribal school-going boys :

Table 4: Distribution of Leg Strength Levels among Rural, Urban, and Tribal Groups

Leg Strength Level	Rural (N=30)	%	Urban (N=30)	%	Tribal (N=30)	%
Low	8	26.67	4	13.33	12	40.00
Moderate	13	43.33	10	33.33	11	36.67
High	9	30.00	16	53.33	7	23.33
Total	30	100	30	100	30	100



Chi-square test value: χ^2 value = 9.64, df =4, p =0.047* (*Significant at 0.05 level)

Table 4 depicts the distribution of leg strength among rural, urban, and tribal school-going boys. Urban participants exhibit the highest proportion of high leg strength (53.33%), followed by rural (30.00%) and tribal groups (23.33%). Tribal boys show the highest percentage in the low leg strength category (40.00%).

The dominance of urban boys in the high leg strength category can be linked to systematic physical training, availability of sports infrastructure, and participation in competitive sports. Rural boys demonstrate moderate development, likely due to active lifestyles but limited formal conditioning programs.

Tribal boys, despite engaging in physically demanding daily activities, may experience inadequate nutrition and lack of structured training, which can restrict maximal strength development. These findings emphasize that daily physical activity alone may not be sufficient for optimal athletic strength without scientific training methods. Overall, the distribution highlights socio-geographical disparities in leg strength development and underscores the importance of inclusive sports development policies.

Conclusion :

The findings of the present study lead to the conclusion that both type of throwing event and socio-geographical background play a significant role in determining shoulder and leg strength among school-going boys of Nagpur Gramin district. Javelin throwers were found to possess superior shoulder strength, reflecting the biomechanical demands of repetitive overhead throwing movements. In contrast, shot putters demonstrated greater leg strength due to the emphasis on explosive lower-body force generation in the event.

Furthermore, the comparative analysis among rural, urban, and tribal groups revealed that urban boys exhibited higher levels of both shoulder and leg strength, while tribal participants showed comparatively lower strength levels. These differences may be attributed to variations in access to sports facilities, coaching, nutritional support, and structured training opportunities.

The study highlights the importance of sport-specific training programs and the need for inclusive physical education policies to bridge the strength development gap among rural and tribal athletes. Providing scientific training methods, adequate infrastructure, and nutritional awareness can contribute significantly to improving athletic performance at the school level. Overall, the study contributes valuable insights for coaches, physical education teachers, and sports administrators involved in talent identification and development.

The study concludes that shoulder and leg strength significantly differ based on type of throwing event and socio-geographical background. Javelin throwers possess greater shoulder strength, while shot putters demonstrate superior leg strength. Urban boys outperform rural and tribal counterparts in both strength parameters. The findings highlight the importance of scientific training methods and the need for inclusive sports development



programs for rural and tribal athletes.

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