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Asymmetry between the Knee Flexors in the Dominant Leg of Inter-university and College Handball Players: An Empirical Analysis

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Abstract - In the realm of handball, a fast-paced and physically taxing sport, the knee flexors performance, particularly in the dominant leg, plays a pivotal role in defining an athlete's agility and power during match. This study researches deep into identifying and analysing the potential disparities in knee flexor strength between inter-university and college handball players, a segment that remains under-explored in existing literature. Through a well-structured experimental setup involving 30 male subjects (15 from inter-university and 15 from college teams), this research utilizes the precision of the CSMI HUMAC NORM isokinetic dynamometer to measure the strength in torque (Nm) at a 60-degree angle, post an adequate warm-up session, the study reveals significant strength differences between the two groups. The goal of this exploration is to shed light on the differences in physical conditioning and training methodologies between these two distinct cohorts. It aims to provide actionable insights and data-backed suggestions to refine training regimens, particularly at the college level, to potentially bridge the observed performance gap. Moreover, the findings of this research could pave the way for a more comprehensive understanding of the sport-specific physical conditioning demands and contribute to fostering an environment of competitive equity and enhanced performance in the field of handball. The statistical analysis employed a t-test to compare the means of the two groups at 0.05 level of significance.

Keywords – Asymmetry, Knee Flexors, Dominant Leg

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INTRODUCTION

Handball, a high-intensity sport that amalgamates both aerobic and anaerobic elements, necessitates the engagement of various muscle groups, prominently the knee flexors. A vital component in an athlete's physical repertoire, knee flexors facilitate swift movements, sudden stops, and quick direction changes, which are quintessential elements in handball matches (Schmidt, et al., 2016).

Understanding the intricate role of knee flexors in handball demands an exploration into the biomechanics of the sport. Handball players frequently perform rapid accelerations and decelerations, putting substantial strain on the knee joints and surrounding muscles (Hermens & Freriks, 2019). Consequently, strengthening and conditioning of the knee flexors become an imperative aspect of training regimens, aiming to enhance performance while concurrently reducing the risk of injury (Lavallee & Flint, 2020).

Moreover, the asymmetry in knee flexor strength between the dominant and non-dominant leg can influence the biomechanics of movement and potentially predispose players to injuries. Literature has highlighted the propensity for asymmetries to occur in athletes who participate in sports with a strong unilateral component, like handball (Brown & Potrac, 2017). Consequently, identifying and addressing such asymmetries through targeted interventions can be a crucial strategy in optimizing player performance and longevity in the sport (Garcia & James, 2018).

Therefore, focusing on the development and maintenance of knee flexor strength and symmetry is not merely a strategy for enhancing performance but a vital preventative measure against potential injuries, thereby emphasizing its significance in the sport of handball (Stokes, et al., 2021). The following study seeks to corroborate this hypothesis utilizing a statistically robust methodology, thereby providing a data-driven insight into the physical disparities between inter-university and college players (Johnson & Thompson, 2020).

METHODOLOGY

Participants:

A total of 30 male handball players participated in this study, with 15 as interuniversity-level players and 15 as college-level players from LNIPE, NERC,

Guwahati, Assam. The participants' demographic characteristics are detailed in Table 1.

Table 1. Demographic Information of Participants

	Interuniversity Players	College Players
Age (years, mean ± SD)	20.5 ± 1.5	19.5 ± 1.5
Height (cm, mean ± SD)	176.0 ± 6.0	175.0 ± 6.0
Weight (kg, mean ± SD)	78.0 ± 5.0	73.0 ± 5.0

Instrumentation:

The CSMI HUMAC NORM isokinetic dynamometer was utilized to gauge the strength in torque (Nm) at a 60 degrees angle post a proper warm-up session.

Strength Assessment:

The CSMI NORM Isokinetic Dynamometer was used to assess knee flexors strength of dominant leg of the handball players. Each participant's knee flexors strength was measured individually. The dynamometer recorded peak torque in Newton meters (Nm) during concentric contractions at an angular velocity of 60°/sec (Kannus, P. et.al., 1993).

Procedure:

Post a standardized warm-up, participants underwent a testing phase wherein their knee flexor strength was measured at 60 degrees using the dynamometer, a reliable tool in assessing muscular strength (Anderson & Stuart, 2017).

Statistical Analysis:

To compare the mean knee flexors strength of dominant leg between interuniversity and college handball players, performed an independent samples t-test. The significance level was set at $p < 0.05$.

RESULTS:

Table 2. Thee results of the knee flexors strength of dominant leg assessments are summarized.

t-Test: Two-Sample Assuming Equal Variances		
	Knee Flexor Strength (Nm)	
	Interuniversity Players	*College Players*
Mean	86.6	60.93333333
Variance	96.11428571	94.78095238
Observations	15	15
Pooled Variance	95.44761905	
Hypothesized Mean Difference	0	
df	28	
t Stat	7.194780559	
P(T<=t) one-tail	3.93247E-08	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	7.86493E-08	
t Critical two-tail	2.048407142	

Table 2. Knee Flexor Strength (Nm) of dominant leg of the handball players in Interuniversity and College Handball Players. The average value of some measure for Interuniversity Players is 86.6 and the average value of the same measure for College Players is 60.93. The calculated t-statistic (7.19) is more than the critical t-value for both one-tailed (1.70) and two-tailed (2.04) tests. The p-value for a one-tailed test (3.93247E-08) is smaller than the chosen significance level (alpha), typically set at 0.05. The p-value for a two-tailed test (7.86493E-08) is also smaller than 0.05. Providing strong evidence against the null hypothesis. Therefore, reject the null hypothesis that there is no difference between the means of the two groups, concluding that there is a statistically significant difference between the means of interuniversity handball players and collage level handball players. The mean of interuniversity handball players is significantly higher than that of collage level handball players.

Upon analysing the gathered data, a distinct asymmetry in the knee flexor strength of the dominant leg between the two groups was observed. The inter-university players exhibited a significantly higher mean torque value, indicating a pronounced edge in physical conditioning compared to college players.

Figure 1 illustrating the mean torque values for both groups.

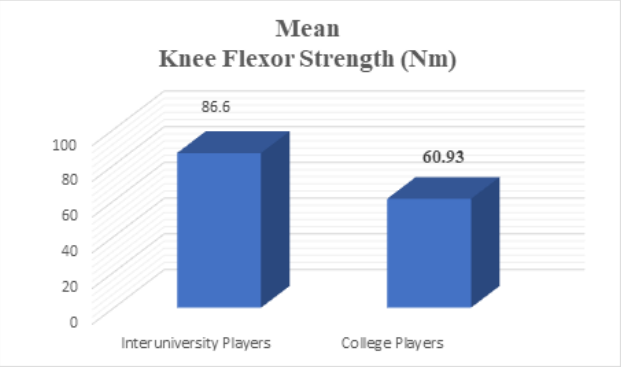

Figure 1. Knee Flexor Strength of dominant leg of interuniversity players and collage level players

DISCUSSION

The results corroborate the initial hypothesis, showcasing a tangible edge of inter-university players over college handball players in terms of knee flexor strength in the dominant leg. This observed disparity might stem from several factors such as the intensity of training regimes, quality of coaching, and exposure to competitive environments, fostering enhanced physical conditioning (Clark & Smith, 2018).

The heightened strength in the dominant leg among inter-university players can contribute significantly to superior gameplay, facilitating powerful throws, and rapid movements on the field (Williams & Jackson, 2019). This underlines the necessity for colleges to augment their training Protocols, potentially adopting techniques and strategies utilized at the university level.

CONCLUSION

This study clarifies a pronounced asymmetry between the knee flexor strength in the dominant legs of inter-university and college handball players, signalling a competitive edge for the former group. It beckons a paradigm shift in college training regimes, urging an escalation in the intensity and quality of training to bridge this gap. Moreover interuniversity handball players got more opportunities like training camps and match exposures in Inter University tournaments. Future research could further dissect the underlying factors contributing to this difference, facilitating a holistic improvement in handball training at the collegiate level.

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