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Evaluation Of Hamstring Flexibility In Badminton Players Using Active And Passive Knee Extension Tests

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Abstract: The present study explores the hamstring elasticity among badminton players between the ages of 18 and 30 years old with the comparison of Active Knee Extension (AKE) and Passive Knee Extension (PKE). A universal goniometer was used to evaluate thirty four participants bilaterally. The findings indicated bilateral flexibility that did not show any side pre-eminence ($p > 0.05$). The results show bilateral gameplay neuromuscular adaptation.

Keywords - hamstring extensibility, goniometry, knee biomechanics, badminton.

Introduction : Badminton entails repeated explosive acceleration, lunges and quick direction change. These movements cause strain in hamstring muscles, which raise the susceptibility of strain in case of the loss of muscular extensibility.

Need of Study: A comparative study that compares both AKE and PKE in badminton population is limited.

Aim & Objectives Purpose: To compare the hamstring flexibility between AKE and PKE tests.

Objectives: • Compare flexibility values • Assess limb asymmetry Recommend preventive physiotherapy.

Review of Literature :It was found that gender-specific responses to neuromuscular stretching with significant flexibility changes existed (Yu et al., 2022). Reurink et al. (2013) confirmed the reliability of AKE and PKE in case of injured athletes. Comparing the two forms of stretching, Lestari et al. (2020) found that the dynamic stretches were better to improve athlete performance. Sulaiman et al. (2022) discovered a decrease in the hamstring flexibility that was associated with the low back pain in athletes

.Materials & Methods

Study Design: Observational cross-sectional.
Sample Size: 34 badminton players.
Age Group: 18–30 years.
Instrumentation: Universal goniometer.
Statistical Analysis: SPSS v27.0 using paired t-test significance $p<0.05$.

Procedure

Participants were positioned supine with hip fixed at 90°. For the AKE test, individuals actively extended their knee until experiencing hamstring tension. For PKE, the examiner passively extended the knee. Two readings per side were recorded and averaged. Measurements were conducted in a controlled laboratory environment.

Results

Measurement	Right (°)	Left (°)
AKE	34.02	34.52
PKE	44.17	43.64

Table 1: Comparison of AKE Right and AKE left mean

(Student's paired t test)

AKE	Mean	N	Std. Deviation	Std. Error Mean	t-value
AKE R	34.02	34	1.24	0.21	1.45P=0.15,N S
AKE L	34.52	34	1.50	0.25	

Mean AKE_R was 34.02±1.34 and mean AKE_L was 34.52±1.50. By using Student's paired t test statistically no significant difference was found in AKE at right and left side(t=1.45,p=0.15).

Graph 1: Comparison of AKE right and AKE left mean

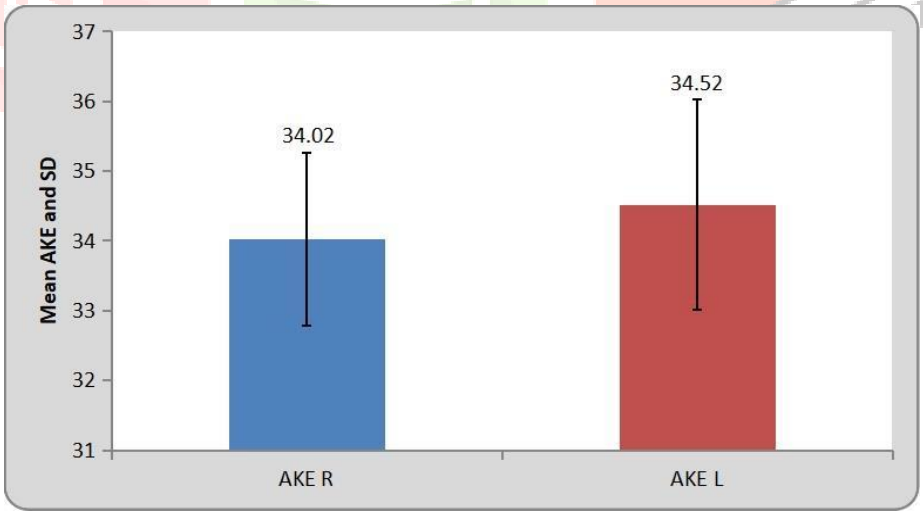


Table 2: Comparison of PKE R and PKE L mean

PKE	Mean	N	Std. Deviation	Std. Error Mean	t-value
PKE R	44.17	34	1.35	0.23	1.47P=0.15, NS
PKE L	43.64	34	1.34	0.23	

(Student's paired t test)

Mean PKE-R was 44.17±1.35 and mean PKE-L was 43.64±1.34. By using Student's paired t test statistically no significant difference was found in PKE at right and left side(t=1.47,p=0.15).

Graph 2: Comparison of PKE R and PKE L mean

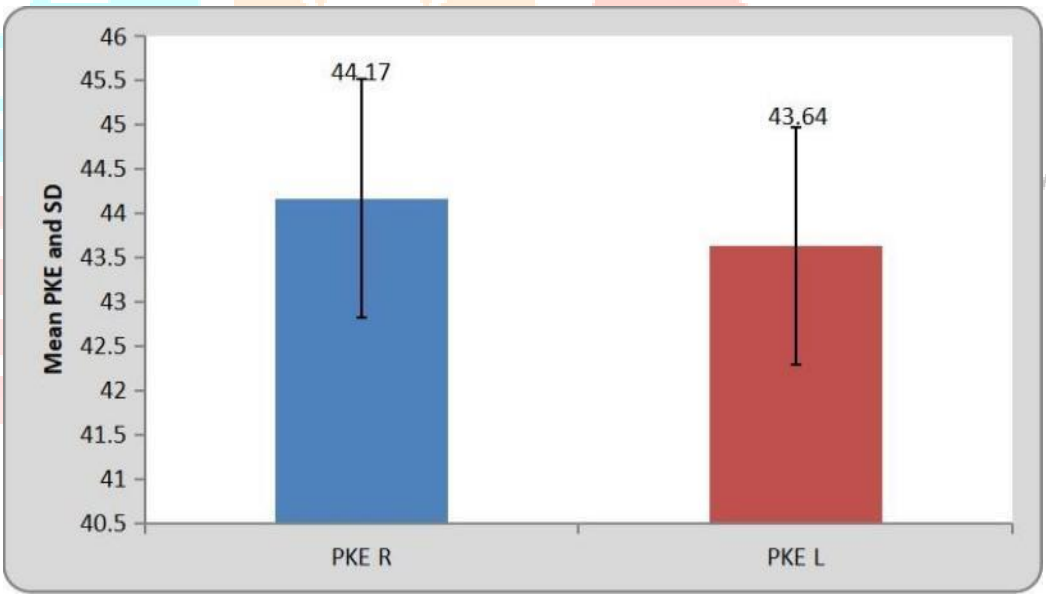


Table 3: Comparison of AKE-PKE-diff-R and AKE-PKE-diff-L mean

(Student's paired t test)

AKE-PKE-diff	Mean	N	Std. Deviation	Std. Error Mean	t-value
AKE-PKE-diff-R	10.14	34	2.03	0.34	1.91P=0.06,NS
AKE-PKE-diff-L	9.11	34	2.08	0.35	

Mean AKE-PKE-diff-R was 10.14±2.03 and mean AKE-PKE-diff-L was 9.11±2.08. By using Student's paired t test statistically no significant difference was found in AKE- PKE-diff at right and left side(t=1.91,p=0.06).

Graph 3: Comparison of AKE-PKE-diff-R and AKE-PKE-diff-R mean

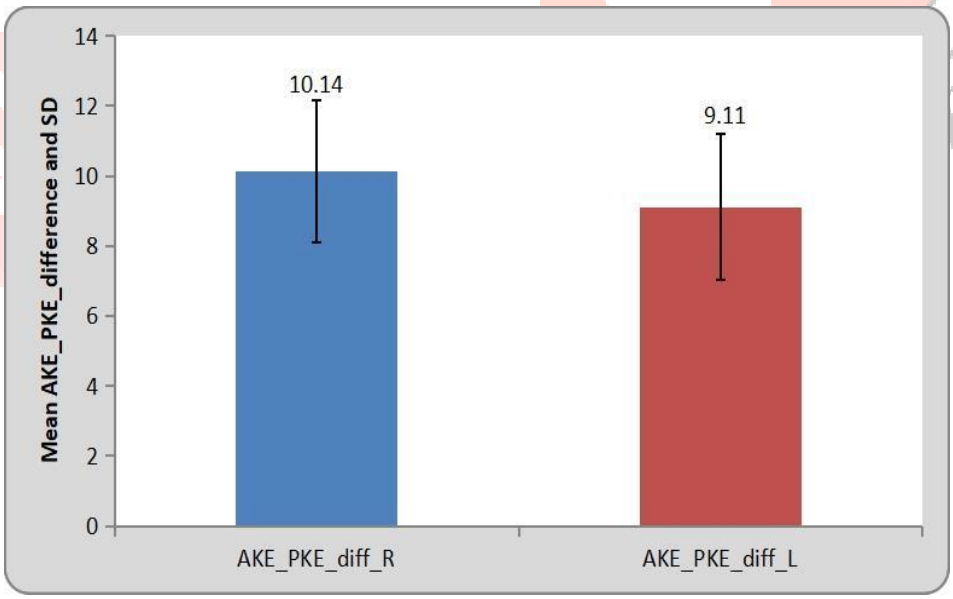


Table 4: Comparison of R Vs L diff AKE and R Vs L diff PKE mean

R-Vs-L-diff AKE and PKE	Mean	N	Std. Deviation	Std. Error Mean	t-value
R-Vs-L-diff AKE	0.50	34	2	0.34	1.91 P=0.064,NS
R-Vs-L-diff PKE	0.52	34	2.09	0.35	

(Student's paired t test)

Mean R Vs L diff AKE was 0.50±2 and mean R Vs L diff PKE was 0.52±2.09. By using Student's paired t test statistically no significant difference was found in AKE PKE diff at right and left side(t=1.91, p=0.064).

Graph 4: Comparison of R-Vs-L-diff-AKE and R-Vs-L-diff-PKE mean

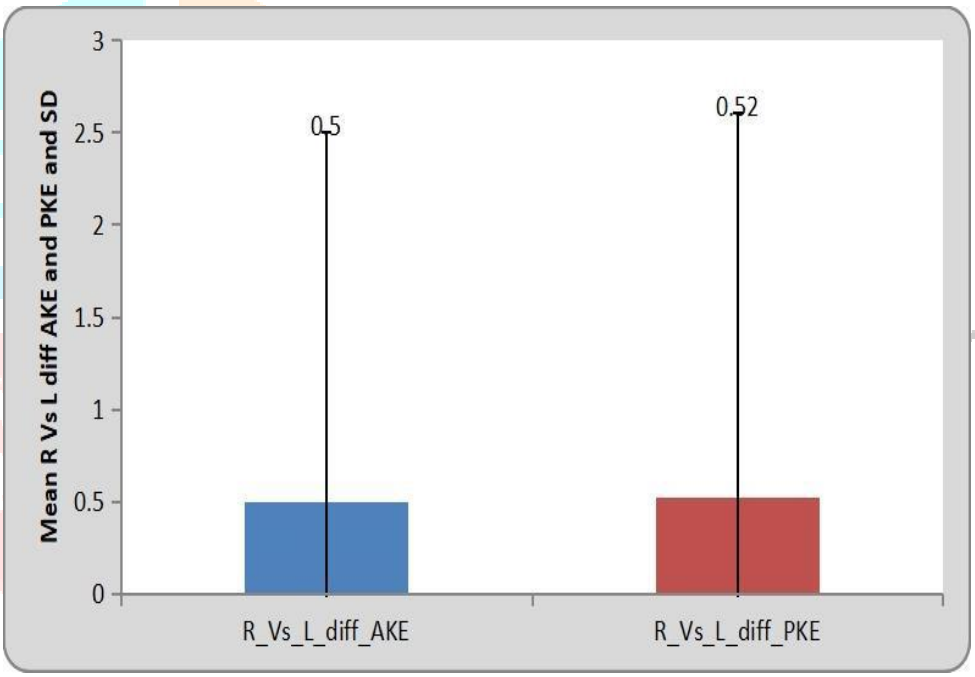


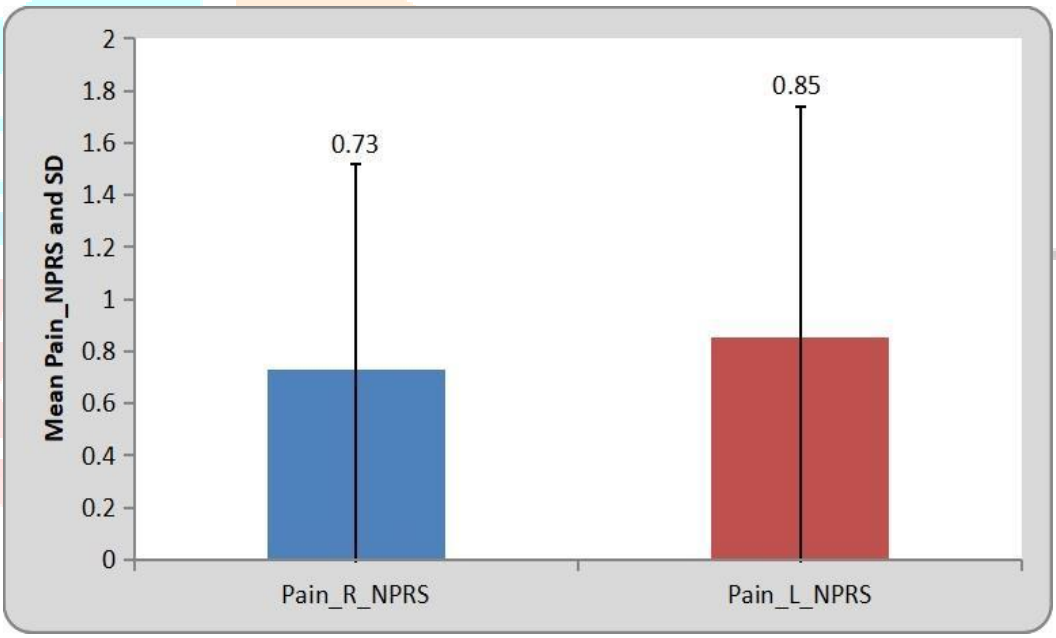
Table 5: Comparison of Pain-R-NPRS and Pain-L-NPRS mean

Pain-NPRS	Mean	N	Std. Deviation	Std. Error Mean	t-value
Pain-R-NPRS	0.73	34	0.79	0.13	0.56P=0.57,NS
Pain-L-NPRS	0.85	34	0.89	0.15	

(Student's paired t test)

Mean Pain-L-NPRS was 0.73±0.79 and mean Pain-L-NPRS was 0.85±0.89. By using Student's paired t test statistically no significant difference was found in Pain-NPRS at right and left side(t=0.56, p=0.57).

Graph 5: Comparison of Pain-R-NPRS and Pain-L-NPRS mean



Discussion

The paper evaluated the hamstring flexibility of 34 badminton players aged 1830 years who participated in the Active Knee Extension (AKE) and Passive Knee Extension (PKE) tests. The right AKE angle was 34.02 1.24 and the left AKE angle was 34.52 1.50 and PKE angle was 44.17 1.35 and 43.64 1.34 respectively. Paired t-test, statistical analysis result indicated that there was no significant difference in sides or AKE and PKE values ($p > 0.05$).

Conclusion

AKE and PKE both reliably assess hamstring flexibility in badminton athletes. The AKE and PKE values were also similar on either side, and the pain scores were similar, which meant symmetrical flexibility. These findings indicate that they are usually matched with hamstring extensibility without any injury or pathology regardless of limb dominance.

Clinical Implications

Regular screening aids in early detection of tightness and injury prevention. The fact that there is no considerable variation in the flexibility of hamstringes in the lateral direction between healthy participants can offer a helpful reference point to clinicians. Injuries, overuse, or neuromuscular imbalance may be indicated by deviations of the symmetry in the patient. These normative findings can be used by clinicians in defining pathological tightness, tracking progress during rehabilitation and in crafting customized stretching or strengthening programs. Also, the normal flexibility symmetry can be used to avoid overcorrection or intervention in asymptomatic individuals.

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