

# An Analysis of Isokinetic Profiles of Patients 8-9 Weeks Post-ACL Reconstruction: An Early Strength Comparison Based on Graft Type



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## Introduction

Current focus of literature regarding ACL reconstruction is two-fold: graft selection and outcomes<sup>1,2</sup>. Physical therapists must recognize the differences in surgical procedures and adjust their rehabilitation guidelines accordingly. Most studies examine long-term outcomes of strength and function. However, physical therapists are often limited in the post-operative time frames with these patients and need to know if the patient is on schedule for a positive outcome.

## Aims

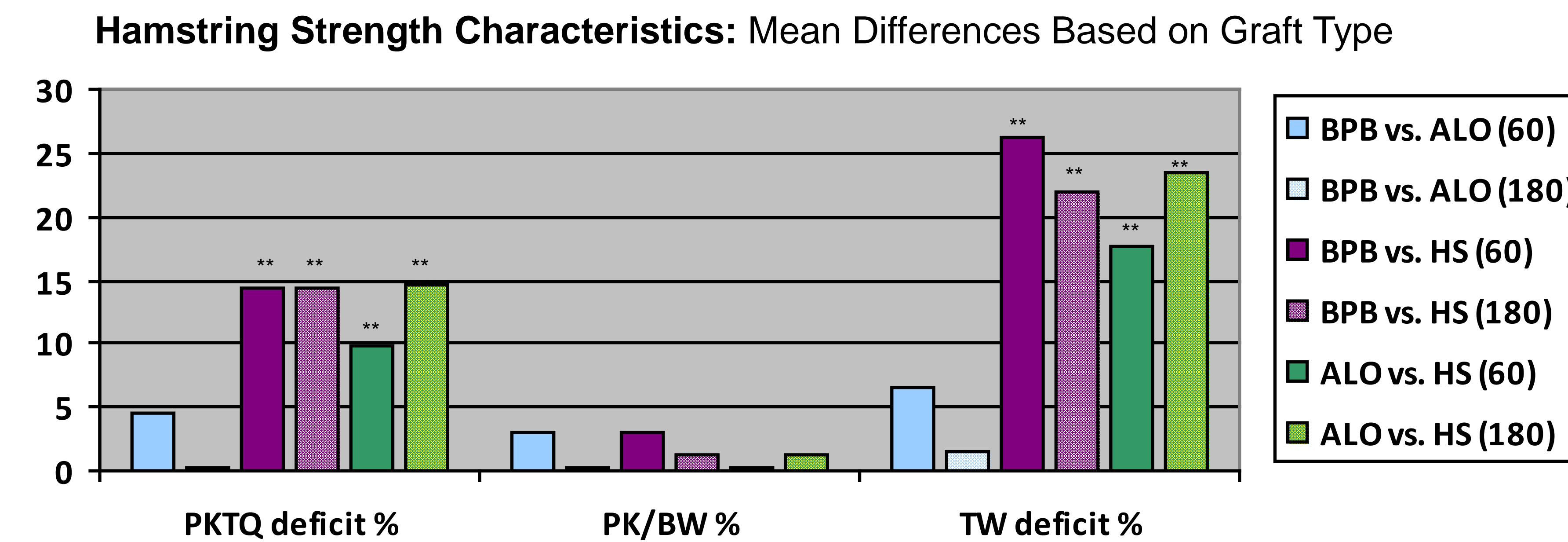
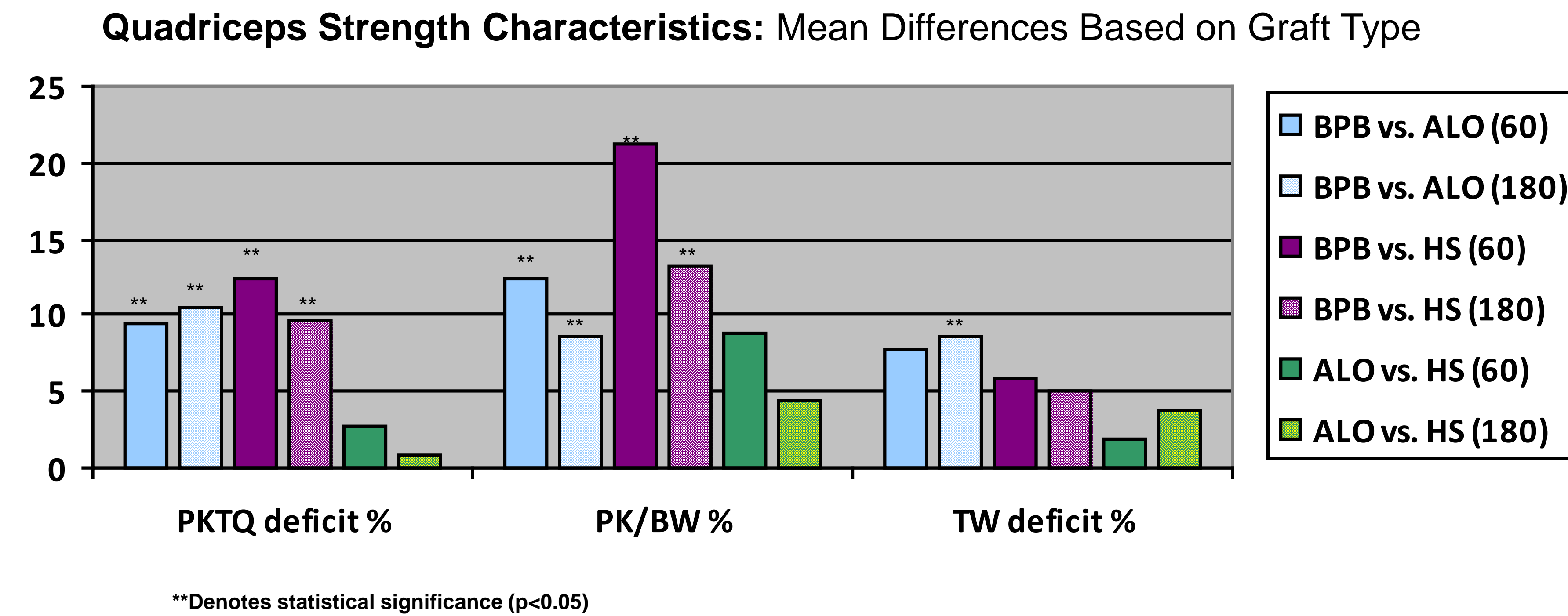
The purpose of this study was to compare the isokinetic strength profiles of ACL reconstruction patients who are post-op week 8-9, grouping the patients by surgical graft type. Specific aims were to identify specific isokinetic strength variables that significantly differ among the groups, analyze the relationships of the differences, and provide descriptive data of the strength outcomes at post-op week 8-9 for clinical interpretation and application.

## Materials & Methods.

This study was a retrospective, causal-comparative design. Patients were grouped based on type of ACL graft selected (bone-patella tendon-bone (BPB), hamstring autograft (HS), and allograft (ALO)). Patients performed isokinetic strength testing using a Biodex System 2 at speeds of 60 and 180 degrees/second (d/s). Concentric quadriceps and hamstring strength was measured at both speeds using the following:

- peak torque percent difference from uninvolved (PKTQ % diff)
- peak torque torque/body weight ratio (PK/BW)
- total work percent difference from uninvolved (TW% diff).

Groups and variables were compared with a multivariate analysis of variance (MANOVA), and a post-hoc Tukey test



Descriptive Data				
	Mean	Surgical Graft		
		BPB	ALO	HS
Age (SD)	25.6 (9.4)	24.4 (9.1)	30.4 (9.1)	21.9 (8.0)
Subjects (M:F)	89 (59:30)	43 (25:18)	26 (20:6)	20 (14:6)
Post-op Week	8.5	8.5	8.5	8.4

Descriptive Data				
		Surgical Graft		
		BPB	ALO	HS
Quadriceps Strength	60 deg/sec			
	Peak Torque Deficit (%)	46.7*	37.2	34.5
	Peak Torque / Body Weight	49.5*	61.8	70.7
	Total Work Deficit (%)	42.9	35.1	37.0
	180 deg/sec			
	Peak Torque Deficit (%)	37.0*	26.6	27.5
Hamstring Strength	60 deg/sec			
	Peak Torque Deficit (%)	14.7	19.3	29.2*
	Peak Torque / Body Weight	36.6	33.6	33.4
	Total Work Deficit (%)	18.5	25.0	44.7*
	180 deg/sec			
	Peak Torque Deficit (%)	10.1	9.8	24.5*

\*Denotes statistical significance (p<0.05) found in post-hoc Tukey Test

Statistical Analysis: Multivariate Analysis of Variance					
	F	Sig.	Partial Eta Squared	Observed Power	
Wilks' Lambda	3.925	.000	.386	1.000	
Source	Dependent Variables				
Surgery	Q: 60 PKTQ Deficit (%)	6.630	.002	.134	.904
	Q: 60 Pk/BW	10.679	.000	.199	.988
	Q: 60 TW Deficit (%)	2.579	.082	.057	.502
	Q: 180 PKTQ Deficit (%)	5.960	.004	.122	.869
	Q: 180 Pk/BW	7.999	.001	.157	.950
	Q: 180 TW Deficit (%)	3.129	.049	.068	.587
	H: 60 PKTQ Deficit (%)	7.310	.001	.145	.930
	H: 60 Pk/BW	1.496	.230	.034	.311
	H: 60 TW Deficit (%)	20.773	.000	.326	1.000
	H: 180 PKTQ Deficit (%)	7.049	.001	.141	.921
	H:180 Pk/BW	.248	.781	.006	.088
	H: 180 TW Deficit (%)	12.872	.000	.230	.996

## Results

Multivariate testing revealed significant differences between groups (Wilks' lambda p=.000, partial eta squared .386, observed power 1.000). Isokinetic measures of the quadriceps that significantly differed (p<0.05) between the groups were PKTQ % diff and PK/BW at 60 d/s and 180 d/s. Hamstring measures differed in PKTQ% diff and TW% at 60 d/s and 180 d/s.

Post hoc test revealed significant differences (P<0.05) in the following:

- BPB and HS groups for quadriceps strength measures in PKTQ% diff and PK/BW measures at 60 deg/s and 180 deg/s; and hamstring strength measures in PKTQ% diff and TW% diff at 60 d/s and 180 d/s
- BPB and ALO for quadriceps strength measures of PKTQ% diff and PK/BW at 60 and 180 d/s.
- ALO and HS for measures in hamstring strength in PKTQ% and TW% at 60 d/s and 180 d/s

## Conclusion & Clinical Relevance

This study reveals the differences in the strength characteristics of ACL-reconstructed patients based on the type of graft utilized in surgery in the second post-operative month. This suggests that graft choice should factor into the clinical decision making process of physical therapists in the exercise prescription and rehabilitation progression of early post-op ACL reconstruction patients.

## References

1. Carey JL, Dunn WR, Dahm DL, Zeger SL, Spindler KP. A systematic review of anterior cruciate ligament reconstruction with autograft compared to allograft. *J Bone Joint Surg Am.* 2009; 91: 2242-2250.
2. West RV, Harner CD. Graft selection in anterior cruciate ligament reconstruction. *J Am Acad Orthop Surg.* 2005; 3: 197-207.