

MUSCLE ACTIVATION PATTERN OF LOWER EXTREMITY MUSCLES IN SELECTED BASKETBALL TASKS

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INTRODUCTION

The anterior cruciate ligament (ACL) injury is a common sports injury in basketball athletes [1]. It needs specific functional task for rehabilitation to assist athletes return to sports [1-4]. Enhance, understanding the safety and adequacy of those specific functional tasks is priority work. Therefore, the purpose of this study was to understand the muscle activation pattern of lower extremity muscles during performing specific functional basketball tasks.

METHODS

Sixteen high school basketball players voluntarily participated this study (mean age: 18.25±2.78; mean height: 184.50±5.35; mean weight: 74.19±6.43). Four specific basketball tasks including sudden stop, jump shot, twist, and cross over movement were investigated in this study. Four channels of electronic signals were measured in this study. Quadriceps and hamstrings were measured by 2 EMG channels. The other channel was used to measure knee joint motion by electrogoniometer. The last channel was used to measure the foot-to-ground contact by self-designed foot switch. All signals were simultaneously collected with sampling 1000Hz. One-way ANOVA was used to examine the differences among four tasks' EMG activities. Scheffe's multiple comparisons were used to examine the difference between each test group.

RESULTS AND DISCUSSION

The results showed that quadriceps and hamstring EMG intensities during sudden stop and jump shot were significantly higher ($p<.05$) than cross over and twist. However, the hamstrings to quadriceps EMG ration showed that sudden stop and jump shot were significantly ($p<.05$) less than cross over and twist.

Table 1 Parameters of four basketball tasks

Parameters		Sudden Stop		Jump Shot		Twist		Cross over		
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knee flexion angle; deg	Pre-airing	59.28 ^A	4.19	74.92 ^{A,B}	11.61	70.81 ^{A,C}	5.11	54.80 ^{B,C}	11.10	
	Landing	26.99 ^A	9.39	30.72 ^B	7.01	63.06 ^{A,B}	6.59	56.93 ^{A,B}	10.25	
EMG; mv										
Quadriceps	Pre-airing	15.87 ^A	9.58	35.20 ^{A,B}	22.46	29.00 ^C	12.41	11.31 ^{B,C}	6.26	
	Landing	62.27 ^A	19.39	74.36 ^B	29.79	36.38 ^{A,B}	12.12	33.38 ^{A,B}	16.42	
Hamstring	Pre-airing	45.47 ^A	14.02	37.25 ^B	10.84	32.13 ^{A,C}	14.56	14.57 ^{A,B,C}	8.59	
	Landing	88.80 ^A	15.71	112.92 ^B	22.91	51.07 ^{A,B}	31.90	40.13 ^{A,B}	21.77	
H/Q ratio	Pre-airing	0.36 ^A	0.22	1.17 ^A	0.78	1.02 ^A	0.52	0.89	0.51	
	Landing	0.65 ^A	0.13	0.86	0.38	1.08 ^A	0.39	1.02	1.34	

Note: A, B, C, and D mean with the same letter for post-hoc grouping are significantly different ($p<.05$) in the same row.

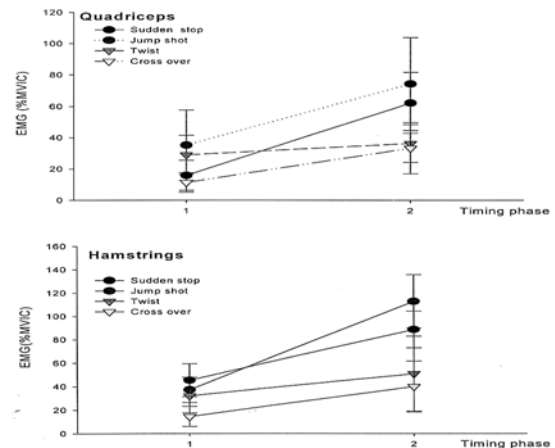


Figure 1: The EMG activation of lower extremities. 1 means pre-airing phase; 2 means landing phase.

CONCLUSIONS

In order to protect a basketball athlete with ACL injury, the clinician and coach have to understand the safety priority among basketball tasks. Based on present study findings, we believed that the sudden stop and stop shot were more dangerous than cross over and twist. These findings can be implicated in knee rehabilitation program, especially in the return-to-sports phase [2-4]. The results suggest that exercise program of sudden stop and jump shot should be described on the last phase of knee rehabilitation program.

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