THE EFFECTS OF FATIGUE AND GENDER ON PLANT LEG EMG DURING AN INSTEP SOCCER KICK

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INTRODUCTION

The instep kick in soccer is primarily used as a maximal kick. As the body fatigues during the game the ability of the plant leg to absorb the forces produced by the momentum of the body may leave the knee susceptible to injury [1]. This may be more true for females as they tend to approach the ball with similar velocities to men, but have lower strength values [2]. Though studies have reported injury rates [3], electromyographical (EMG) data as it applies to fatigue or gender is lacking. The purpose of this study was to compare rested and fatigued conditions across genders for EMG activity in an instep soccer kick.

METHODS

Twelve female and 14 male amateur soccer players with a minimum of 10 years experience performed 3 maximal instep kicks prior to and following a 90 min fatigue protocol. The fatigue protocol included 9,600 m of walking, sprinting, running, and changes in direction [4]. EMG data (average rectified values (ARV) and mean frequencies) were collected for the rectus femoris (RF), bicep femoris (BF), gastroc lateralis (GL) and gastroc medialis (GM) in both rested and fatigued conditions. Repeated measures 2x2 ANOVAs ($p<.05$) were used to test significance.

RESULTS AND DISCUSSION

ARVs were lower with fatigue across all muscles for both genders, but only the RF showed significance (Table 1). The interaction effect for the RF approached significance ($p = .078$), as the women fatigued their ARVs decreased at a higher rate than the males (Figure 1). Frequency values showed mixed results, with the females RF increasing in frequency with fatigue while the males remained relatively the same (Table 1). The GL mean frequencies showed interaction between the genders and fatigue (Figure 2). The females showed higher RF ARV values compared to the males, while the males showed higher BF values. This disproportional recruitment in females has been noted in the literature with women more dependent on RF activity and men more dependent on BF to control the plant leg [3]. These results may increase women's anterior shear forces in the joint, particularly with fatigue.

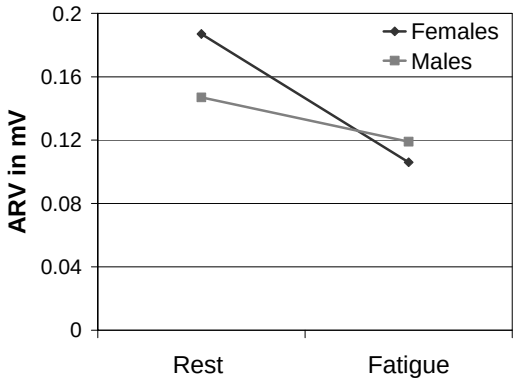

Figure 1: Interaction for the RF ARV.

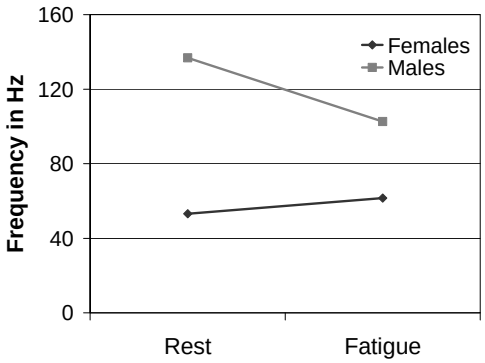

Figure 2: Interaction for the GL mean frequency.

CONCLUSIONS

The RF and GL experienced more pronounced ARV value decreases with the females. The mean frequency GL values increased for the females, but decreased for the males. The use of the RF by the females to control the motion may lead them to be more susceptible to knee injuries with fatigue.

REFERENCES

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Table 1: Mean ARV and Frequency by gender and fatigue.

	Average Rectified Value (ARV) mV				Frequencies Hz			
	RF	**BF**	**GL**	**GM**	**RF**	**BF**	**GL**	**GM**
Women(n)	10	7	7	9	9	7	7	9
Rest	.187±.121*	.175±.095	.218±.107	.168±.082	36.9±10.7	51.9±14.2	53.2±7.0	66.5±12.8
Fatigue	.106±.071*		.138±.064	.163±.091	46.8±11.8	49.7±10.4	61.6±13.3	62.7±22.6
Men(n)	12	8	8	12	10	6	6	11
Rest	.147±.053*	.194±.062	.170±.097	.182±.057	79.6±18.6	92.6±18.2	136.8±32.3	118.7±34.5
Fatigue	.119±.084*	.149±.079	.151±.110	.158±.086	79.7±30.5	93.9±20.0	102.6±61.0	122.1±36.8

*Significant differences ($p<.05$) with fatigue.