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The Effects of a Four Week ACL-Prevention Program on the McCall Hamstring Test in High School Female Volleyball Athletes

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Abstract

The purpose of this study is to investigate the hamstring strength in an ACL prevention program by the pre and post testing of the McCall Hamstring Test. Anterior Cruciate Ligament (ACL) injuries happen by a tear at the ligament. Specifically, female athletes involved in volleyball or basketball participate in jump landing movements. During the jump landing women are seen to have decreased knee flexion, increased quadriceps dominance vs. hamstring muscles being used, and valgus knee compared to men.⁹ Prevention programs have included multiple exercises in different areas such as eccentric strengthening exercises for the hamstrings, plyometrics (jump-landing control), and balance.⁴ Over multiple studies these areas of exercises have been chosen to reduce the risk factors of young female athletes. The goal is to implement an ACL preventative program for young female athletes to strengthen their hamstring, enhance their jump-landing control, and balance.

Methods

12 high school female athletes, aged 16 +/- 0.63246 years participated in a 3-week length of ACL prevention program.

Athletes who had any previous ACL or PCL injuries were excluded from the study. We initially had (n=13) participants at the start of the study and ended with (n=12) participants that completed the program. The study started off with one week of testing and three weeks of the ACL Intervention Program.³ The McCall hamstring test was taken pre and post which measured unilateral strength of the hamstring to obtain the average force while the knee was in flexion.⁵

Forms used: Consent and Assent Forms for ages 15-17 and approved by the Institutional Review Board at OBU

Procedure: Force plates were raised on a platform w/ 12 aerobic steps, connected to the Kinvent Physio APP, and WIFI

3-week Program: double-leg lateral cone jumps (10 reps, 1 set), seated hamstring curls (8 reps, 2 sets), sliding leg curls with towels (8 reps, 2 sets), and single-leg balance stands (20 sec each leg)

Results

The results of this study showed that the combination of exercises over a 3-week span of time increased the means baseline assessments for the Average Force (Table 1). The Alpha level is set to <0.05 level of significance. A significant change was shown in the left leg (p= .054) but not in the right leg (p=.689) as shown in Table 2. No significance difference was found in decreasing the Fatigue levels (Table 2).

Results cont.

Table 1 Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreLeftAvgForce	10.5455	11	5.14497	1.55127
	PostLAvGForce	12.7091	11	3.07586	.92741
Pair 2	PreRightAvgForce	12.6000	11	3.94968	1.19087
	PostAvgForce	12.8455	11	2.93304	.88435
Pair 3	PreLeftfatigue	-.6965	11	.58804	.17730
	PostLFatigue	-1.0958	11	1.75402	.52886
Pair 4	PreRightFatigue	-2.1095	11	2.26883	.68408
	PostAvgfatigue	-.8789	11	.91231	.27507

Table 2 Paired Samples Test

		Paired Differences			Significance	
		Mean	Std. Deviation	Std. Error Mean	One-Sided p	Two-Sided p
Pair 1	PreLeftAvgForce - PostLAvGForce	-2.16364	3.29068	.99218	.027	.054
Pair 2	PreRightAvgForce - PostAvgForce	-.24545	1.97604	.59580	.345	.689
Pair 3	PreLeftfatigue - PostLFatigue	.39928	1.73368	.52272	.231	.463
Pair 4	PreRightFatigue - PostAvgfatigue	-1.23055	2.35725	.71074	.057	.114

Conclusion

After given a 3-week prevention program, the exercise areas in plyometrics, strengthening, and balance are key factors in a program. The results show that the left leg average force increased from pre (10.54) to post (12.70). The left leg results were significant though the right leg average force for pre (12.60) and post (12.84) did not show significant improvement. This could have been an affect from right leg dominance. Fatigue was also a factor studied and presented a small amount of change in the right leg, so it was not found significant. When looking at the significant difference, the analysis reported that there was a strong correlation from the program to the post-test. The ACL program found that plyometrics, strengthening, and balance are areas that will help improve strength. Though further studies need to be done to specify what exercises should be used. In addition, more research needs to be done regarding the McCall hamstring test to obtain normative data.

References

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