NCAA DIVISION-I ATHLETE ASSESSEMENT OVER A 4-YEAR SPAN: PERFORMANCE, FUNCTION, AND ANTHROPOMETRICS

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INTRODUCTION

Motion capture systems (MCS) can be used to assess an individual's upper-and lower-body motions, both explosive and functional in nature. While NCAA Division I athletes undergo significant physical and physiological changes throughout their collegiate careers, these adaptations may be year specific, influencing their injury susceptibility and response to training programs.

PURPOSE

The purpose of this study was to examine the changes in performance, function and anthropometric characteristics across a 4-year window consisting of grouping by year.

METHODS

Ten thousand male athletes volunteered for this investigation. Each athlete performed a functional movement screen (FMS), consisting of 10 movements. Including unilateral squats, bilateral squat, unilateral lateral lunges, single leg balance, vertical jump (VJ), and unilateral VJs. A total of 100,000 movement files were analyzed for the current investigation across a four-year span. A three-dimensional markerless motion capture system (DARI Motion Inc, Overland Park, KS) was used to analyze the kinetic and kinematic variables of interest that were calculated and reported (squat depths, lunge distances, VJs heights, balance, weight, and kinetic variables). Statistical analyses were conducted using the descriptive variables x years (year 1-4) repeated measures ANOVA ($p < 0.05$).

RESULTS

The repeated measures ANOVA indicated that the 4 groups of male athletes compared did not show a significant difference for jumping task outputs (jump height). There were significant increases observed in force-time metrics such as impulse and power, as well as increase in athletes' body mass (Table 01). Additionally, the data did show a significant decrease in functional task outputs such as lunge distances and squat depths, but only in the 4th year when compared to 1st year.

Figure 1a

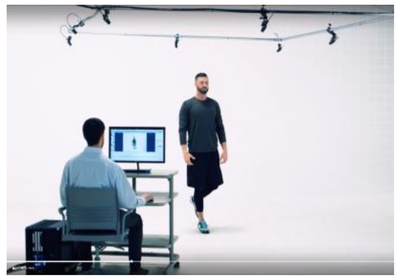

Figure 1b

Figure 1a, 1b. Displays the markerless motion capture system (MCS) used for investigation (Figure 1a) and example of MCS report used for the Functional Movement Screening (Figure 1b).

DISCUSSIONS

The male athletes tend to demonstrate changes in physical and performance characteristics that promote adaptation related to mass and momentum management across the four-year span.

RESULTS (Table 01)

Table 01. Kinetic and kinematic variables ($\bar{X} \pm$ SD) of interest performed during the Functional Movement Screening across a four year span.

	Year 1	Year 2	Year 3	Year 4
Bilateral Squat Depth (in)	18.6 ± 3.9	17.2 ± 4.3	17.1 ± 3.6	15.2 ± 2.8*
Unilateral Squat Depth (in)	12.6 ± 4.1	12.2 ± 4.4	11.6 ± 2.9	9.2 ± 2.7*
Unilateral Lateral Lunge Distance (in)	44.6 ± 5.9	43.6 ± 4.5	40.2 ± 4.9	40.1 ± 3.8*
Bilateral Vertical Jump Height (in)	25.2 ± 5.4	27.1 ± 6.9	27.6 ± 5.2	27.9 ± 5.3
Unilateral Vertical Jump Height (in)	12.6 ± 4.9	13.6 ± 5.9	13.6 ± 4.1	13.9 ±4.6
Bilateral Vertical Jump - Impulse (Ns)	166.2 ± 50.1	189.2 ± 62.3	248.5 ± 72.3*	297.1 ± 80.9*
Bilateral Vertical Jump - Power (w)	2896.0 ± 452.0	3125.0 ± 561.0	3865.0 ± 633.0*	4456.6 ± 854*
Bilateral Vertical Jump - Peak GRF (N)	1752.0 ± 318.0	1985 ± 388	2063 ± 412	2523.6 ± 637
Weight (Kg)	79.0 ± 16.1	87.6 ± 15.9	91.2 ± 17.9*	96.4 ± 20.9*
Balance Sway (in2)	2.1 ± 2.1	2.6 ± 1.5	2.2 ± 1.4	2.9 ± 1.7

n = 2,500 male collegiate athletes, (*) indicates ANOVA significant difference ($p<0.05$).

PRACTICAL APPLICATION

While training male athletes one may not see overtime phenotype changes related to performance (ie jump height). Thus, to monitor adaptations appropriately in male athletes one will need adequate measurement tools.