

Biomechanical and Statistical Effects of Changing the Three-Point Line in Division III Women's Basketball

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ABSTRACT

The NCAA has recently changed the distance for the three-point line in women's basketball, which may affect shooting mechanics for a three-point shot. While the fundamental movements of the shot should not be affected by increasing distance, some elements of the shot may need to change to propel the ball the required distance. PURPOSE: To analyze the effect of increased distance of the basketball three-point line on shot kinematics and shooting performance of female basketball players. METHODS: Ten players (19.0 ± 0.6 yrs, 173.7 ± 8.7 cm, 64.0 ± 8.2 kg) from an NCAA Division III Women's Basketball team shot from the current three-point line, 20'9" from the basket, and the old line, 19'9" from the basket. Shots were compared using knee range of motion (ROM), release height, release velocity, and release angle as measured using a motion analysis system. Two separate cameras filmed the shooter and flight of the ball from a sagittal view at 60 Hz. Three-point field goal (FG) and three-point FG made per game statistics for all Division III women's basketball teams were also compared for the 2009-10, 2010-11, and 2011-12 seasons. RESULTS: Shots taken from the new three-point line resulted in about 3% faster velocities at release (7.82 ± 0.23 m/s) than those from the old line (7.60 ± 0.19 m/s) ($t_{(19)}=4.17$, $p=0.001$). Further, the Cohen-d calculation displayed a large effect of shooting distance on release velocity. The mean release velocity from the new line would be greater than 93% of the release velocities from the old line ($d=0.933$). Use of the new line in the 2011-12 season resulted in a 1.6% reduction of three-point FG percentage ($28.50 \pm 3.73\%$) than the previous two seasons ($29.98 \pm 3.74\%$ and $30.12 \pm 3.78\%$, respectively) ($F_{(2, 1266)}=24.34$, $p<0.001$), as found by the Tukey post hoc test where the percentage from 2011-12 was less than the 2009-10 season ($p<0.01$) and the 2010-11 season ($p<0.01$). The 2011-12 season also produced a 7.9% decrease in the number of three-point FG made per game (4.46 ± 1.40 shots/game) than the 2010-11 season (4.84 ± 1.40 shots/game), but not the 2009-10 season (4.68 ± 1.37 shots/game) ($F_{(2, 1268)}=12.64$, $p<0.01$), as found by a Tukey post hoc test finding that 2011-12 was less than 2010-11 ($p<0.01$), but not different than 2009-10 ($p=0.09$). CONCLUSION: The increase in the three-point line distance required an increase in the release velocity to perform successfully, which had a meaningful negative effect on the performance of Division III women's basketball players.

