ACUTE INFLUENCE OF RESISTANCE TRAINING ON TWO-POINT SHOOTING MECHANICS AND ACCURACY IN MALE BASKETBALL PLAYERS

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Introduction

While the importance of properly developed and well-implemented strength and conditioning programs for optimal basketball performance remains undisputed, the skepticism pertaining to whether resistance exercise reduces on-court shooting performance is still present.

Purpose

The purpose of the present study was to investigate the acute influence of upper-body and lower-body resistance training on two-point basketball shooting mechanics and accuracy.

Methods

Ten resistance-trained subjects (height= 182.6±9.7 cm; body mass= 79.2±13.9 kg; age= 25.6±5.5 years) with previous basketball playing experience performed control, upper-body, and lower-body resistance training sessions on three different laboratory visits in randomized order, separated 3-7 days apart. Following each training session, participants attempted 15 two-point shots (5.2 m) immediately, 30, 60, 90, and 120 min post-completion of testing protocols. A camera recording at 120 fps positioned 10 m perpendicular to the shooting plane of motion and Kinovea video analysis software were used to capture and analyze the following kinematic variables of interest: ankle angle (internal angle between shank and the ground), knee angle (internal angle between thigh and shank), hip angle (internal angle between torso and thigh), elbow angle (internal angle between upper arm and forearm), elbow height (distance between the olecranon process and the ground adjusted by subject's height), release angle (angle between the fully extended arm and the ground), and release height (distance between the ball and ground adjusted by subject's height). See Figure 1. To determine the effect of condition and time on each dependent variable, a restricted maximum likelihood linear mixed-effect model analysis was used. Condition and time were specified as fixed effects and subject as a random effect. All statistical analyses were performed using R software (Version 4.2.1; $p<0.05$).

Results

No significant interaction effect (p=0.87) and the main effect for time was observed (p=0.85). A significant main effect for the condition was present (p=0.02), where an upper-body training session resulted in a 7.2% mean decrease in shooting percentage (p=0.02). However, no statistically significant effects were found in any of the kinematic variables of interest (Table 1).

Variable	Time [min]	Control	Lower-body	Upper-body
Shooting percentage [%]	0	0.69 (0.18)	0.61 (0.18)	0.57 (0.21)
	30	0.65 (0.13)	0.65 (0.14)	0.57 (0.19)
	60	0.67 (0.23)	0.67 (0.18)	0.62 (0.24)
	90	0.65 (0.14)	0.66 (0.14	0.63 (0.21)
	120	0.71 (0.13)	0.60 (0.15)	0.61 (0.17)
Ankle angle [deg]	0	49.4 (6.2)	50.4 (6.2)	49.5 (7.5)
	30	48.8 (6.00)	50.6 (6.6)	48.3 (7.5)
	60	48.9 (6.50)	49.5 (6.1)	49.9 (7.0)
	90	49.7 (6.3)	49.1 (5.8)	49.0 (6.2)
	120	49.4 (6.5)	49.5 (5.7)	49.8 (5.2)
Knee angle [deg]	0	108.2 (9.9)	105.0 (12.3)	106.6 (11.7)
	30	107.2 (8.3)	108.7 (8.3)	105.7 (11.8)
	60	106.9 (9.1)	108.2 (7.8)	107.5 (11.5)
	90	108.5 (8.8)	107.4 (8.4)	106.8 (9.8)
	120	107.4 (9.1)	107.8 (8.4)	107.8 (8.2)
Hip angle [deg]	0	139.7 (7.0)	137.9 (6.7)	138.2 (9.1)
	30	138.4 (8.4)	138.8 (8.7)	137.7 (8.7)
	60	138.5 (8.1)	140.4 (6.9)	139.6 (8.0)
	90	139.1 (8.0)	139.3 (6.5)	138.5 (8.0)
	120	138.5 (7.4)	138.5 (8.0)	139.1 (6.4)
Elbow angle [deg]	0	57.9 (11.8)	57.5 (10.1)	57.5 (10.8)
	30	58.4 (11.0)	58.0 (10.4)	57.7 (12.2)
	60	57.9 (12.0)	57.4 (11.8)	57.4 (11.4)
	90	58.6 (10.4)	57.9 (10.2)	57.8 (9.1)
	120	58.2 (11.4)	57.4 (9.4)	57.7 (10.2)
Elbow height [ratio]	0	0.68 (0.06)	0.67 (0.06)	0.66 (0.06)
	30	0.68 (0.05)	0.67 (0.05)	0.67 (0.06)
	60	0.68 (0.04)	0.67 (0.04)	0.67 (0.07)
	90	0.68 (0.05)	0.67 (0.05)	0.66 (0.05)
	120	0.67 (0.05)	0.67 (0.05)	0.67 (0.05)
Release angle [deg]	0	55.2 (7.1)	56.1 (7.3)	54.8 (6.9)
	30	55.0 (6.7)	55.3 (6.3)	54.8 (6.2)
	60	55.5 (5.6)	55.4 (7.5)	55.7 (5.5)
	90	55.3 (5.5)	55.5 (6.9)	55.7 (6.7)
	120	55.4 (5.1)	55.4 (6.8)	54.8 (6.4)
Release height [ratio]	0	1.30 (0.05)	1.29 (0.03)	1.30 (0.05)
	30	1.30 (0.05)	1.29 (0.04)	1.26 (0.13)
	60	1.30 (0.05)	1.30 (0.05)	1.30 (0.05)
	90	1.30 (0.05)	1.29 (0.05)	1.30 (0.04)
	120	1.30 (0.05)	1.29 (0.06)	1.29 (0.05)

Table 1. Descriptive statistics, means and standard deviations, for two-point shooting percentage and kinematic variables during control, upper-body, and lower-body resistance training sessions across five testing time points.

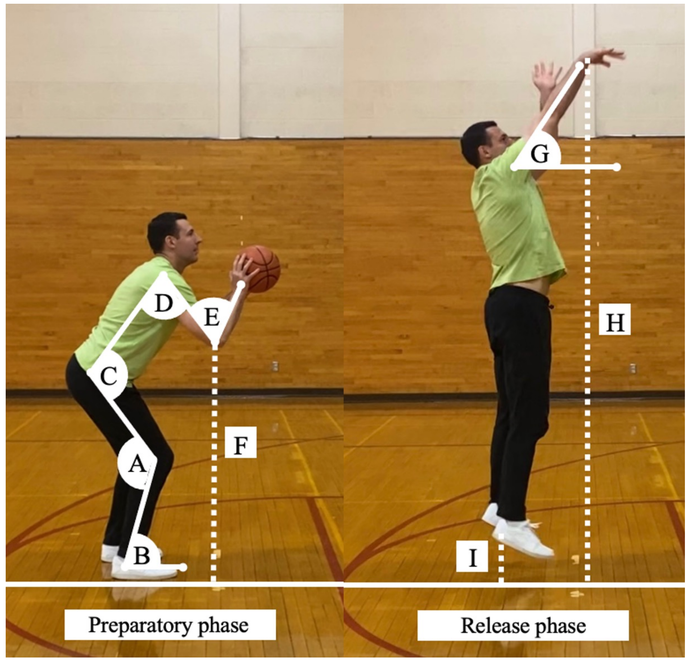

Figure 1. Graphical representation of the biomechanical parameters during the preparatory and release phases of shooting motions. Knee angle (A); ankle angle (B); hip angle (C); shoulder angle (D); elbow angle (E); elbow height (F); release angle (G); release height (H); heel height (I).

Conclusions

Our results indicate that the upper-body resistance training session can elicit a significant decrease in two-point shooting accuracy that can last up to 30 min, while the lower-body resistance training session had no meaningful impact. Also, it is important to note that the observed changes in accuracy are not caused by alterations in the kinematics of shooting motion, but rather by other biomechanical parameters that warrant further investigation. Overall, these findings may help practitioners to advance some of the currently implemented practices related to the designing and scheduling of resistance training sessions during a basketball season targeted toward optimizing on-court mid-range jump-shooting performance.

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