ACUTE IMPACT OF RESISTANCE EXERCISE ON FEMALE BASKETBALL PLAYERS' JUMP-SHOOTING PERFORMANCE

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Introduction

Among many other aspects of sports performance, there is a lack of scientific literature focused on examining the biomechanical characteristics of shooting motions in female basketball players as well as how they change in response to on-court competitive demands.

Purpose

The purpose of the present study was to examine the acute impact of resistance exercise on jump-shooting mechanics and accuracy in female basketball players.

Methods

Seven resistance-trained subjects (height= 174.5±11.1 cm; body mass= 74.7±11.8 kg; age= 24.4±3.0 years) 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 mid-range jump 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). 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

A non-statistically significant interaction effect was found between the condition and time ($p=0.53$) as well as for the main effect for time ($p=0.06$). However, the main effect of the condition was statistically significant ($p=0.01$). Both the upper-body and lower-body workouts resulted in a 7.4% mean decrement in shooting accuracy when compared to the control condition, while no difference was observed between upper-body and lower-body training sessions ($p=0.11$). On the other hand, kinematic characteristics remained unchanged between all testing conditions (Table 1).

Variable	Time [min]	Control	Lower-body	Upper-body
Shooting percentage [%]	0	0.64 (0.14)	0.60 (0.19)	0.52 (0.13)
	30	0.66 (0.11)	0.54 (0.11)	0.54 (0.14)
	60	0.67 (0.12)	0.56 (0.08)	0.60 (0.12)
	90	0.69 (0.10)	0.55 (0.11)	0.65 (0.19)
	120	55.7 (4.6)	0.69 (0.10)	0.64 (0.08)
Ankle angle [deg]	0	55.7 (5.4)	56.9 (5.8)	56.7 (5.9)
	30	55.3 (5.8)	58.2 (6.2)	54.1 (6.1)
	60	55.8 (4.6)	56.2 (5.0)	54.9 (7.5)
	90	55.8 (3.9)	56.6 (5.6)	55.3 (5.4)
	120	115.9 (5.9)	54.5 (5.5)	55.0 (6.4)
Knee angle [deg]	0	116.7 (5.7)	117.0 (4.8)	118.7 (7.0)
	30	115.7 (6.8)	119.8 (5.0)	116.4 (9.5)
	60	116.6 (5.4)	117.0 (6.6)	115.8 (9.9)
	90	116.2 (4.2)	118.6 (5.9)	118.0 (9.0)
	120	134.1 (13.8)	116.5 (7.9)	118.6 (9.7)
Hip angle [deg]	0	135.9 (13.2)	133.6 (13.0)	136.1 (13.9)
	30	135.5 (13.5)	136.4 (10.5)	134.4 (15.7)
	60	136 (12.8)	134.8 (15.1)	133.7 (15.4)
	90	136.5 (12.6)	135.6 (12.8)	135.6 (16.6)
	120	54.6 (8.3)	136.7 (16.0)	136.6 (18.8)
Elbow angle [deg]	0	54.3 (7.5)	52.1 (7.6)	53.2 (9.2)
	30	54.6 (5.5)	52.0 (7.9)	52.4 (10.2)
	60	54.3 (6.2)	52.8 (7.8)	53.3 (10.3)
	90	53.1 (6.3)	52.4 (8.4)	53.0 (11.0)
	120	0.62 (0.10)	53.6 (9.2)	52.9 (7.5)
Elbow height [ratio]	0	0.62 (0.08)	0.61 (0.08)	0.63 (0.09)
	30	0.61 (0.07	0.62 (0.06)	0.61 (0.08)
	60	0.61 (0.07)	0.61 (0.08)	0.61 (0.07)
	90	0.61 (0.06)	0.62 (0.07)	0.63 (0.10)
	120	47.6 (12.0)	0.61 (0.08)	0.61 (0.08)
Release angle [deg]	0	44.8 (8.9)	45.7 (14.7)	47.1 (11.9)
	30	47.4 (11.1)	48.2 (11.5)	48.2 (12.0)
	60	46.5 (10.2)	48.5 (12.1)	48.4 (12.0)
	90	46.7 (10.1)	46.6 (11.5)	48.0 (13.0)
	120	1.31 (0.05)	47.0 (10.8)	46.2 (12.8)
Release height [ratio]	0	1.30 (0.05)	1.30 (0.07)	1.31 (0.06)
	30	1.31 (0.04)	1.33 (0.06)	1.30 (0.04)
	60	1.30 (0.04)	1.29 (0.07)	1.30 (0.04)
	90	1.30 (0.04)	1.30 (0.05)	1.31 (0.04)
	120	0.64 (0.14)	1.30 (0.05)	1.29 (0.06)

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

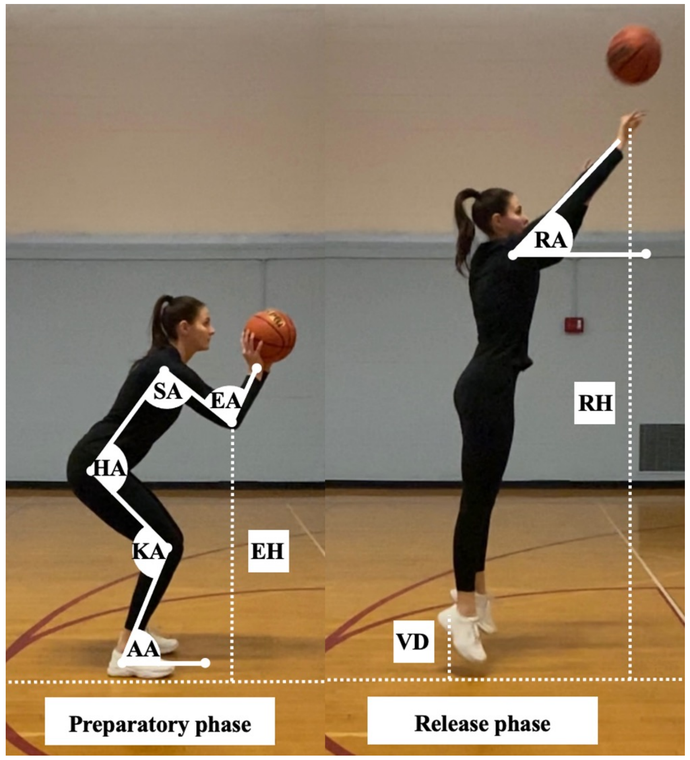

Figure 1. Knee angle (A); ankle angle (B); hip angle (C); shoulder angle (D); elbow angle (E); elbow height (F); release angle (G); release height (H); heel height (I).

Conclusions

Female basketball players' jump-shooting accuracy notably decreased after performing both upper-body and lower-body resistance exercises. However, despite the decrement in accuracy being similar in magnitude between the conditions, it was not caused by changes in shooting mechanics. These findings may help practitioners to advance some of the currently implemented practices pertaining to the design and schedule of resistance training sessions in coordination with on-court practice demands to optimize athletes' performance.

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