International Journal of Strength and Conditioning

Ogata, H., Henderson, F. J., & Yamashita, D. (2026). Position-Specific Benchmarks for Jump and Reach Metrics in the National Basketball Association Draft Combine. International Journal of Strength and Conditioning
https://doi.org/10.47206/ijsc.v6i1.496

Position-Specific Benchmarks for Jump and Reach Metrics in the National Basketball Association Draft Combine

Hiroki Ogata[1,2], Frederick James Henderson[3], and Daichi Yamashita[1,3]*

[1]Graduate School of Physical Education, National Institute of Fitness and Sports in Kanoya, Kagoshima, Japan; [2]Japan Basketball Association, Tokyo, Japan; [3]Japan Institute of Sports Sciences, Tokyo, Japan

Corresponding Author: daichi.yamashita@jpnsport.go.jp

ABSTRACT

This study analysed data from the NBA draft combine and aimed to establish position-specific normative data for jump and reach performance to support coaches in better assessing the jumping ability of basketball players. Data on body height with shoes, standing reach (ST_{Reach}), vertical jump reach (VJ_{Reach}), and running jump reach (RJ_{Reach}) were obtained from publicly available sources for 1,048 players who participated in the NBA draft combine between the 2004-05 and 2022-23 seasons. Vertical jump height (VJ_{Height}), running jump height (RJ_{Height}), and run-up effect (RE) were calculated. These variables were then compared across five playing positions; point guard, shooting guard, small forward, power forward, and center and position-specific percentile scores were generated to create normative data. Results showed that RJ_{Reach} significantly increased from guards to centers (p < .05), primarily reflecting positional differences in anthropometry. Notably, guards demonstrated significantly higher VJ_{Height}, RJ_{Height}, and RE (p < .05) compared to power forwards and centers, indicating that shorter players may compensate for their height through enhanced vertical jump and RE. Furthermore, height and ST_{Reach} progressively increased from guards to centers, highlighting the contribution of anthropometric, non-trainable characteristics. VJ_{Reach} and RJ_{Reach} increased across positions, and this increase was significant between all positions but power forwards and centers. RE was higher in guards and forwards than in centers. These results imply that RE may capture unique, trainable aspects of jump performance. This study presents position-specific benchmarks for jumping ability, offering strength and conditioning coaches practical reference values to assess players' strengths and weaknesses and to design tailored training programs.

INTRODUCTION

Developing jumping during basketball training is essential because higher reach improves rebounding and shot blocking, both vital for National Basketball Association (NBA) success (1,6,9,25). Of concern to strength and conditioning (S&C) coaches, while jumping reach is trainable in elite players (19), it is also influenced by non-trainable factors such as body height and standing reach (ST_{Reach}) (26,27). Consequently, understanding how trainable and untrainable factors affect jump reach is fundamental in designing appropriate training strategies for basketball players. However, existing evaluation methods may not effectively distinguish between trainable and non-trainable components.

Insight into the trainable and non-trainable factors of jump performance can be gained from data collected at the NBA Draft Combine. This multi-day evaluation event preceding player recruitment includes the standardized assessment of ST_{Reach}, vertical jump height (VJ_{Height}), and running jump height (RJ_{Height}) (27). From these three measures, the actual height reached during vertical jumps (VJ_{Reach}) can be computed by adding ST_{Reach} to VJ_{Height} and, during running jumps (RJ_{Reach}), by adding ST_{Reach} to RJ_{Height}. Subsequently, by subtracting VJ_{Reach} from RJ_{Reach}, a potentially key trainable variable can be computed: the run-up effect (RE). RE is of particular interest because RJ_{Reach} may exceed VJ_{Reach} due to the effective utilization of the running approach (6) and sprinting frequency depends on playing position (1). Therefore, jump assessments including VJ_{Reach}, RJ_{Reach}, and RE would not only reflect a player's jumping ability more thoroughly, but also identify which components to train more accurately.

In this context, providing S&C coaches with normative data about jumping including VJ_{Reach}, RJ_{Reach}, and RE should better support realistic goal-setting for S&C programs (10); either for players aiming to join the NBA with its historical preference for taller players (3,14), or other comparable professional basketball leagues worldwide, e.g., Euroleague or Japanese B-League. However, no such normative values for these variables have been established.

Playing position is another important factor to consider. Indeed, height generally increases from guards to forwards to centers among NBA Combine prospects (7,22), with studies reporting countermovement jump height being the highest in guards in National Collegiate Athletic Association (NCAA) Division I players (4) and Bosnian professional players (16). VJ_{Reach}, RJ_{Reach}, and RE are thus likely to similarly vary by position. Consequently, to be the most useful to coaches, normative data should be position-specific.

The aim of this study was to use publicly available NBA combine data to establish normative data for measures of jumping by position with a focus on RJ_{Reach} and its contributing factors. We hypothesized that 1) RJ_{Reach} would increase from guards to forwards to centers, reflecting positional differences in anthropometric characteristics, and 2) jump height and RE would be higher in positions with lower body height players.

MATERIALS AND METHODS

Participants

Data for this study were obtained from the NBA Draft Combine from 2004-05 to 2022-23 season, accessed through the NBA's official website (12). All participants were required to be at least 19 years of age in the year of the draft (27). Players without available data for position, height with shoes, ST_{Reach}, or jump-related test results were excluded from the analysis. In total, 1,048 players were included in the analysis and categorized into five playing positions based on the position registered at the combine: Point Guards (PG, n = 213), Shooting Guards (SG, n = 260), Small Forwards (SF, n = 198), Power Forwards (PF, n = 264), and Centers (C, n = 113). If a player was identified in two playing positions (e.g., PG-SG or SG-SF), they were classified based on their first position (5).

Procedures and Variables

Although the official NBA Draft Combine testing protocol is not publicly available, its procedures have been described in previous literature (7,27). The variables selected for analysis included height with shoes, standing reach, vertical jump height, vertical jump reach, running jump height, running jump reach, and run-up effect. The description of the variables is presented in Table 1. All data were converted to the International System of Units (SI).

Statistical Analyses

All statistical analyses were conducted using IBM SPSS Statistics (Version 29.0, IBM Corp., Armonk, NY, USA). Statistical significance was set at $p < .05$. To examine positional differences across all variables, the following statistical procedures were employed. First, the normality of the data was assessed using the Shapiro-Wilk test. For variables that followed a normal distribution (i.e., RJ_{Reach}), Levene's test was used to assess homogeneity of variances. Welch's ANOVA was then applied and, where variances were unequal, the Games-Howell test was used for post-hoc comparisons. For variables not following a normal distribution (i.e., all except RJ_{Reach}), the Kruskal-Wallis test was used to determine significant differences, followed by multiple comparisons using Dunn's method with Bonferroni correction. Descriptive statistics were presented as mean and standard deviation for normally distributed variables, and as median and interquartile range (IQR) for non-normally distributed variables.

Given that many of the measured items in this study did not follow a normal distribution, the bootstrap method was utilized. To establish benchmarks for

Table 1. NBA combine test variables and their definitions in this study (Including unit differences)

NBA Combine test names	Variable definitions in this study	Abbreviation	Description
Height with shoes	Height with shoes (m)		Measured using a physician's scale while the player is wearing shoes.
Standing reach	Standing reach (m)	ST_{Reach}	Distance from the floor to the fingertips with arms fully extended upward, measured via measuring tape.
Standing vertical leap	Vertical jump height (m)	VJ_{Height}	The difference between ST_{Reach} and VJ_{Reach}. The player jumps vertically as high as possible and touches the Vertec device without a running start.
	Vertical jump reach (m)	VJ_{Reach}	Distance from the floor to the fingertips at the peak of a standing vertical leap.
Max vertical leap	Running jump height (m)	RJ_{Height}	The difference between ST_{Reach} and RJ_{Reach}. The player jumps vertically as high as possible and touches the Vertec device with a running start.
	Running jump reach (m)	RJ_{Reach}	Distance from the floor to the fingertips at the peak of a running vertical leap.
	Run-up effect (m)	RE	The difference between RJ_{Reach} and VJ_{Reach}.

From NBA Draft Combine (12), Teramoto et al. (27), and Cui et al. (7).

each variable, bootstrapping was used to calculate percentile values (0-100%, in 5% increments) for each position and create a percentile table based on data resampled 1000 times. The 0% value represented the lower limit of the 95% confidence interval (CI), and the 100% value represented the upper limit of the 95% CI. The bootstrap method used to obtain robust estimates is detailed elsewhere (18).

RESULTS

Descriptive statistics are summarized in Table 2, and percentile values for height with shoes, ST_{Reach}, VJ_{Height}, RJ_{Height}, VJ_{Reach}, RJ_{Reach}, and RE are presented in Tables 3 to 9.

Height with shoes, ST_{Reach}, and body mass displayed a significant and progressive increase across positions from PG to C ($p < .05$). Significant variations between positions were observed for VJ_{Height} between PF and PG or SG, as well as C and all 4 other positions ($p < .05$). RJ_{Height} also exhibited significant differences between PF and PG, SG, or SF, and between C and PG, SG, SF, or PF ($p < .05$). Both VJ_{Reach} and RJ_{Reach} increased significantly between all positions except PF-C from PG to C ($p < .05$). Finally, RE varied significantly among PF and PG, SG, or SF, as well as C and all other positions ($p < .05$); RE in PG, SG, and SF being significantly higher than PF and C, with PF being significantly higher than C.

DISCUSSION

In this study, we hypothesized that 1) RJ_{Reach} would significantly increase from backcourt to frontcourt owing to differences in anthropometric characteristics, and 2) jump height and RE would be higher in positions with players of shorter stature. This was confirmed by our results, which showed RJ_{Reach} increased significantly across positions, largely reflecting differences in height and standing reach. Supporting our second hypothesis, we observed that VJ_{Height}, RJ_{Height}, and RE were greater in positions with shorter players, such as guards, indicating that these players may compensate for their shorter stature with greater heights and run-up effects.

Anthropometric measures showed clear positional differences, progressively increasing from PG to C. As height is largely non-trainable, this indicator may best serve talent identification, especially for guards and small forwards. For example, PG, SG, and SF in the top 16 teams of the FIBA World Cup were taller than those in the lower-ranked teams, illustrating the importance of height in these positions at the international level (28). Not only height, but also ST_{Reach} increased progressively from PG to C. Assuming equal jump height, higher reach provides an advantage in rebounding and blocking, which are considered winning factors in NBA games (6). Therefore, coaches must recognize that a player's position on the court may depend strongly on untrainable anthropometric traits such as body height and ST_{Reach}, demanding that training strategies be position-specific. This rationale may

Table 2. Descriptive statistics and comparisons of combine test measurements.

Variables	Position									
	ALL (N = 1,048)	PG (N = 213)	SG (N = 260)		SF (N = 198)		PF (N = 264)		C (N = 113)	
Height with shoes (m)	2.01 (1.94, 2.06)	1.89 ± 0.05	1.96 ± 0.03	*	2.02 ± 0.03	*†	2.06 (2.04, 2.08)	*†‡	2.11 (2.08, 2.13)	*†‡§
Standing reach (m)	2.63 (2.54, 2.78)	2.46 ± 0.07	2.57 ± 0.06	*	2.65 ± 0.06	*†	2.72 (2.68, 2.74)	*†‡	2.78 (2.76, 2.83)	*†‡§
Body mass (kg)	96.4 (88.9, 105.4)	85.85 ± 6.34	91.76 ± 5.90	*	97.67 ± 6.38	*†	106.31 ± 7.91	*†‡	110.13 (106.87, 116.57)	*†‡§
Vertical jump height (m)	0.75 (0.69, 0.80)	0.76 ± 0.07	0.76 (0.71, 0.81)		0.75 ± 0.08		0.72 (0.69, 0.77)	*†	0.69 (0.63, 0.75)	*†‡§
Running jump height (m)	0.89 (0.81, 0.95)	0.91 ± 0.09	0.92 ± 0.08		0.89 ± 0.09		0.86 ± 0.08	*†‡	0.80 (0.74, 0.85)	*†‡§
Vertical jump reach (m)	3.38 (3.3, 3.45)	3.22 ± 0.09	3.33 ± 0.08	*	3.39 (3.35, 3.44)	*†	3.45 ± 0.08	*†‡	3.48 ± 0.09	*†‡
Running jump reach (m)	3.51 (3.44, 3.58)	3.37 ± 0.11	3.49 ± 0.08	*	3.54 ± 0.08	*†	3.57 ± 0.08	*†‡	3.59 ± 0.09	*†‡
Run-up effect (m)	0.16 (0.13, 0.19)	0.15 ± 0.04	0.15 (0.13, 0.18)		0.14 ± 0.05		0.13 (0.10, 0.15)	*†‡	0.10 ± 0.04	*†‡§

*Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center. Normally distributed data were presented as means and standard deviations. Non-normally distributed data were presented as medians with interquartile ranges (IQR). Statistics presented: mean ± SD; median (IQR). Significant differences are indicated by superscripts, p < .05. *Different from "PG"; †Different from "SG"; ‡Different from "SF"; §Different from "PF".*

also extend to talent identification and training-strategy development.

Positional differences were also observed in jump height. PG and SG had higher VJ_{Height} and RJ_{Height} than PF and C, with PF outperforming C in both measures. Regarding VJ_{Height}, owing to their shorter reach, guards may benefit most from a greater vertical jump height. Regarding RJ_{Height}, although game jump frequency does not vary by position, sprint frequency shows clear position-specific differences, with guards performing sprints more frequently than other positions (1). Several studies in male basketball players have also shown a correlation between vertical jump height and change of direction test performance (2,3,8,14). Importantly, jump height is modifiable through strength and plyometric training, with exercises such as squats and power cleans having been shown to improve performance (13,17). Therefore, athletes may benefit the most from position-specific interventions that not only focus on vertical but also horizontal in-game demands.

Similar to jump height, VJ_{Reach} and RJ_{Reach} increased significantly from PG, to SG, to SF, to PF. In contrast, RE was similar among PG, SG, and SF, but significantly higher than that in PF or C, with PF showing greater RE than C. In a previous study investigating the positional characteristics of RJ_{Height}, guards achieved higher jump heights than C (15). In practical terms, if an athlete's RE is below expectations (e.g., VJ_{Reach} is in the 85th percentile, but RE is below the 50th percentile), S&C coaches may be best served focusing on intervention involving skill training for running jumps or resistance training. Indeed, RJ_{Reach} involves the lower limb's stretch-shortening cycle (SSC) in transitioning from multiple steps to a jump (20); therefore, improving SSC capabilities could enhance RE. In addition, research on volleyball has reported that VJ_{Height} and peak knee joint power correlate with takeoff velocity during spike jumps (10); therefore, improving knee extensor strength through resistance training may be beneficial to improving RE and subsequent jump height. While VJ_{Reach} and RJ_{Reach} increase progressively from guards to forwards, the run-up effect demonstrates a different pattern, being greater in guards and forwards than in centers. Our findings may indicate that RE has distinct characteristics from VJ_{Reach} and RJ_{Reach}; all three variables are trainable, but further investigation is needed to determine the extent to which RE reflects unique characteristics different from VJ_{Reach} and RJ_{Reach}.

This study has several limitations that should be acknowledged. First, the analysis was based on secondary, publicly available data rather than data obtained directly by our research team and thus may lack generalizability to other levels of competition, leagues, age categories, or genders.

Table 3. Percentile rank of height with shoes.

Percentile	PG	SG	SF	PF	C
100	2.019	2.045	2.108	2.191	2.311
95	1.969	2.013	2.076	2.126	2.188
90	1.953	2.000	2.064	2.108	2.160
85	1.937	1.994	2.057	2.096	2.146
80	1.925	1.988	2.045	2.089	2.135
75	1.911	1.981	2.045	2.083	2.134
70	1.910	1.981	2.038	2.076	2.127
65	1.899	1.975	2.032	2.076	2.127
60	1.892	1.972	2.026	2.070	2.121
55	1.892	1.969	2.026	2.064	2.121
50	1.886	1.962	2.019	2.064	2.115
45	1.880	1.956	2.019	2.057	2.108
40	1.873	1.956	2.013	2.051	2.102
35	1.867	1.949	2.007	2.051	2.089
30	1.861	1.943	2.007	2.045	2.089
25	1.854	1.937	2.000	2.045	2.083
20	1.848	1.932	2.000	2.032	2.083
15	1.842	1.930	1.988	2.026	2.076
10	1.822	1.911	1.981	2.019	2.070
5	1.803	1.905	1.975	2.007	2.051
0	1.753	1.848	1.930	1.969	2.019

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

Table 4. Percentile rank of standing reach (ST_{Reach}).

Percentile	PG	SG	SF	PF	C
100	2.68	2.73	2.81	2.86	3.11
95	2.58	2.67	2.74	2.81	2.87
90	2.55	2.64	2.73	2.78	2.87
85	2.54	2.63	2.71	2.77	2.86
80	2.53	2.63	2.69	2.76	2.83
75	2.51	2.62	2.69	2.74	2.83
70	2.50	2.60	2.68	2.74	2.82
65	2.49	2.60	2.67	2.73	2.81
60	2.49	2.59	2.67	2.72	2.79
55	2.48	2.58	2.65	2.72	2.78
50	2.46	2.57	2.65	2.72	2.78
45	2.45	2.57	2.64	2.71	2.77
40	2.45	2.56	2.63	2.71	2.77
35	2.44	2.55	2.63	2.69	2.77
30	2.43	2.54	2.62	2.69	2.76
25	2.41	2.53	2.62	2.68	2.76
20	2.40	2.53	2.60	2.67	2.74
15	2.39	2.50	2.59	2.67	2.74
10	2.36	2.49	2.58	2.64	2.73
5	2.34	2.46	2.55	2.63	2.71
0	2.25	2.40	2.48	2.57	2.69

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

Table 5. Percentile rank of vertical jump height (VJ_{Height}).

Percentile	PG	SG	SF	PF	C
100	0.953	1.054	0.965	0.953	0.940
95	0.876	0.876	0.889	0.851	0.846
90	0.851	0.851	0.864	0.826	0.800
85	0.838	0.826	0.838	0.813	0.775
80	0.826	0.813	0.815	0.800	0.762
75	0.813	0.813	0.803	0.775	0.749
70	0.800	0.800	0.787	0.762	0.724
65	0.787	0.787	0.775	0.749	0.712
60	0.775	0.775	0.762	0.749	0.711
55	0.771	0.775	0.749	0.737	0.699
50	0.762	0.762	0.749	0.724	0.686
45	0.749	0.762	0.737	0.724	0.686
40	0.737	0.749	0.724	0.711	0.673
35	0.737	0.737	0.724	0.699	0.660
30	0.724	0.724	0.711	0.686	0.648
25	0.711	0.711	0.699	0.686	0.629
20	0.699	0.699	0.686	0.673	0.610
15	0.673	0.686	0.671	0.660	0.610
10	0.660	0.673	0.648	0.648	0.584
5	0.631	0.635	0.635	0.622	0.555
0	0.584	0.584	0.559	0.584	0.521

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

Table 6. Percentile rank of running jump height (RJ_{Height}).

Percentile	PG	SG	SF	PF	C
100	1.118	1.219	1.092	1.105	1.130
95	1.058	1.054	1.041	0.978	0.931
90	1.029	1.029	1.016	0.959	0.909
85	1.003	1.003	0.991	0.940	0.864
80	0.991	0.991	0.978	0.927	0.851
75	0.978	0.965	0.953	0.902	0.851
70	0.965	0.961	0.940	0.902	0.836
65	0.953	0.953	0.927	0.889	0.826
60	0.940	0.927	0.914	0.889	0.826
55	0.927	0.927	0.902	0.876	0.800
50	0.914	0.914	0.889	0.857	0.800
45	0.902	0.902	0.876	0.838	0.787
40	0.876	0.889	0.876	0.838	0.775
35	0.864	0.876	0.864	0.826	0.775
30	0.864	0.876	0.847	0.813	0.762
25	0.845	0.864	0.826	0.800	0.737
20	0.838	0.841	0.813	0.787	0.721
15	0.814	0.826	0.800	0.775	0.699
10	0.800	0.800	0.786	0.749	0.686
5	0.758	0.787	0.762	0.724	0.669
0	0.711	0.724	0.673	0.635	0.635

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

Table 7. Percentile rank of standing vertical jump reach (VJ_{Reach}).

Percentile	PG	SG	SF	PF	C
100	3.45	3.56	3.66	3.66	3.71
95	3.37	3.45	3.53	3.58	3.63
90	3.34	3.43	3.48	3.54	3.59
85	3.32	3.42	3.47	3.53	3.58
80	3.30	3.40	3.45	3.52	3.56
75	3.29	3.39	3.44	3.51	3.54
70	3.28	3.38	3.44	3.49	3.53
65	3.25	3.37	3.43	3.48	3.52
60	3.24	3.35	3.42	3.47	3.51
55	3.23	3.34	3.40	3.45	3.49
50	3.23	3.33	3.39	3.44	3.48
45	3.21	3.33	3.39	3.43	3.47
40	3.20	3.32	3.38	3.42	3.45
35	3.19	3.30	3.38	3.42	3.44
30	3.18	3.29	3.37	3.40	3.43
25	3.16	3.28	3.35	3.39	3.42
20	3.14	3.26	3.34	3.38	3.42
15	3.12	3.25	3.33	3.37	3.39
10	3.10	3.23	3.32	3.35	3.37
5	3.07	3.20	3.29	3.33	3.34
0	2.97	3.11	3.23	3.25	3.28

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

Table 8. Percentile rank of running jump reach (RJ_{Reach}).

Percentile	PG	SG	SF	PF	C
100	3.61	3.71	3.76	3.79	3.82
95	3.53	3.63	3.66	3.71	3.72
90	3.51	3.59	3.65	3.68	3.69
85	3.48	3.57	3.62	3.66	3.66
80	3.47	3.56	3.61	3.65	3.66
75	3.45	3.54	3.59	3.63	3.66
70	3.44	3.53	3.58	3.62	3.64
65	3.43	3.52	3.57	3.61	3.63
60	3.40	3.51	3.56	3.59	3.62
55	3.39	3.49	3.54	3.58	3.61
50	3.38	3.49	3.54	3.57	3.59
45	3.38	3.48	3.53	3.56	3.58
40	3.35	3.47	3.53	3.54	3.57
35	3.34	3.45	3.52	3.53	3.56
30	3.32	3.44	3.51	3.52	3.54
25	3.30	3.43	3.51	3.51	3.52
20	3.28	3.42	3.48	3.49	3.52
15	3.25	3.39	3.47	3.49	3.49
10	3.23	3.38	3.45	3.47	3.48
5	3.20	3.35	3.40	3.42	3.43
0	3.09	3.23	3.34	3.38	3.39

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

Table 9. Percentile rank of the run-up effect (RE).

Percentile	PG	SG	SF	PF	C
100	0.27	0.32	0.31	0.29	0.22
95	0.23	0.23	0.22	0.20	0.17
90	0.22	0.22	0.20	0.18	0.15
85	0.20	0.20	0.19	0.17	0.14
80	0.19	0.19	0.18	0.17	0.14
75	0.18	0.18	0.18	0.15	0.14
70	0.18	0.18	0.17	0.14	0.14
65	0.17	0.17	0.17	0.14	0.13
60	0.17	0.17	0.15	0.13	0.11
55	0.15	0.16	0.15	0.13	0.11
50	0.15	0.15	0.15	0.13	0.10
45	0.14	0.15	0.14	0.11	0.10
40	0.14	0.14	0.13	0.11	0.10
35	0.14	0.14	0.13	0.10	0.09
30	0.13	0.13	0.11	0.10	0.08
25	0.13	0.13	0.10	0.10	0.08
20	0.11	0.11	0.10	0.09	0.06
15	0.10	0.10	0.09	0.08	0.06
10	0.09	0.09	0.08	0.06	0.05
5	0.08	0.08	0.06	0.04	0.03
0	0.04	-0.06	-0.03	-0.01	-0.01

Abbreviations: PG, point guard; SG, shooting guard; SF, small forward; PF, power forward; C, center.

A notable limitation concerns the execution of the running jump test. In NBA draft combine, players have the option to perform running jump tests with either a two-foot or one-foot takeoff. However, public data does not specify which option players choose. While it is reasonable to assume that players selected the take-off modality yielding their best performance, it is necessary to understand the differences between these two takeoffs to properly appreciate the RE. A one-foot takeoff involves shallower flexion of the lower limb joints compared to a two-foot takeoff, resulting in a greater ground reaction force (24). Additionally, a one-foot takeoff requires a rapid eccentric load-bearing capacity, and a faster stretch-shortening cycle compared to a two-foot takeoff due to the shorter ground contact time at takeoff (11,21,23). Consequently, future data collection protocols should include take-off modality to enable more precise evaluations of jumping mechanics and training adaptations.

CONCLUSION

Although shorter, backcourt players (e.g., guards) tend to display greater vertical jump height than other positions, their generally shorter stature may not allow them to achieve higher reach than taller, frontcourt players (e.g., centers). This increased jump reach in shorter players appears to be partly explained by a greater run-up effect (RE). Assuming that RE is trainable, focusing on optimizing this variable could be a promising training strategy for shorter players to compensate for their lower reach height. Alternatively, while the lower baseline in RE among taller players like centers might suggest a greater potential for improvement, due to their position on the court close to the basket, improvements in RE may yield only limited improvements in basketball performance. The position-specific benchmarks developed in this study offer a valuable tool for talent detection and development of players involved in the highest levels of basketball worldwide. Strength and conditioning coaches can use these benchmarks to identify players' strengths and weaknesses, personalize training programs by focusing on trainable aspects of jump performance, better assess progression, and support realistic goal-setting with regard to the interplay between both trainable and untrainable factors in the development of basketball jumping performance.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This study received no specific funding in order to be completed.

DATES OF REFERENCE

Submission - 02/01/2025
Acceptance - 12/07/2025
Publication - 09/01/2026

REFERENCES

1. Abdelkrim NB, El Fazaa S, and El Ati J. Time–motion analysis and physiological data of elite under-19-year-old basketball players during competition. Br J Sports Med 41: 69-75, 2007.
2. Alemdaroğlu U. The relationship between muscle strength, anaerobic performance, agility, sprint ability and vertical jump performance in professional basketball players. J Hum Kinet 31: 149-158, 2012.
3. Barrera-Domínguez FJ, Almagro BJ, Tornero-Quiñones I, Sáez-Padilla J, Sierra-Robles Á, and Molina-López J. Decisive factors for a greater performance in the change of direction and its angulation in male basketball players. Int J Environ Res Public Health 17: 6598, 2020.
4. Berberet D, Petway A, Bell K, Gillen Z, Mundy P, Barrera H, Kabo J, Walker D, Medenwald G, Welsh B, and McMahon J. Unlocking basketball athletic performance: Force plate-derived countermovement jump normative reference values from seven ncaa division-i power five men's college basketball teams. Int J Strength Cond 4, 2024.
5. Buchheit M, Manouvrier C, Cassirame J, and Morin JB. Monitoring locomotor load in soccer: Is metabolic power, powerful? Int J Sports Med 36: 1149-1155, 2015.
6. Cabarkapa D, Deane MA, Fry AC, Jones GT, Cabarkapa DV, Philipp NM, and Yu D. Game statistics that discriminate winning and losing at the NBA level of basketball competition. PLoS One 17: e0273427, 2022.
7. Cui Y, Liu F, Bao D, Liu H, Zhang S, and Gómez M. Key anthropometric and physical determinants for different playing positions during national basketball association draft combine test. Front Psychol 10: 2359, 2019.
8. Gisladottir T, Petrović M, Sinković F, and Novak D. The relationship between agility, linear sprinting, and vertical jumping performance in U-14 and professional senior team sports players. Front Sports Act Living 6, 2024.
9. Hofler RA and Payne JE. Efficiency in the national basketball association: A stochastic frontier approach with panel data. Managerial and Decision Economics 27: 279-285, 2006.
10. Ikeda Y, Sasaki Y, and Hamano R. Factors influencing spike jump height in female college volleyball players. J Strength Cond Res 32: 267-273, 2018.
11. Miura K, Yamamoto M, Tamaki H, and Zushi K. Determinants of the abilities to jump higher and shorten the contact time in a running 1-legged vertical jump in basketball. J Strength Cond Res 24: 201-206, 2010.
12. National Basketball Association. NBA advanced stats. https://www.nba.com/stats. Accessed March 1, 2024.
13. Nuzzo JL, McBride JM, Cormie P, and McCaulley GO. Relationship between countermovement jump performance and multijoint isometric and dynamic tests of strength. J Strength Cond Res 22: 699-707, 2008.
14. Papla M, Perenc D, Zając A, Maszczyk A, and Krzysztofik M. Contribution of strength, speed and power characteristics to change of direction performance in male basketball players. Appl Sci, 12: 8484, 2022.
15. Pehar M, Sekulic D, Sisic N, Spasic M, Uljevic O, Krolo A, Milanovic Z, and Sattler T. Evaluation of different jumping tests in defining position-specific and performance-level differences in high level basketball players. Biol Sport 34: 263-272, 2017.
16. Pojskić H, Šeparović V, Užičanin E, Muratović M, and Mačković S. Positional role differences in the aerobic and anaerobic power of elite basketball players. J Hum Kinet 49: 219-227, 2015.
17. Ramirez-Campillo R, García-Hermoso A, Moran J, Chaabene H, Negra Y, and Scanlan AT. The effects of plyometric jump training on physical fitness attributes in basketball players: A meta-analysis. J Sport Health Sci 11: 656-670, 2022.
18. Rousselet GA, Pernet CR, and Wilcox RR. The percentile bootstrap: A primer with step-by-step instructions in r. Adv Meth Pract Psychol Sci 4: 2515245920911881, 2021.
19. Sanders GJ, Boos B, Rhodes J, Kollock RO, Peacock CA, and Scheadler CM. Factors associated with minimal changes in countermovement jump performance throughout a competitive division I collegiate basketball season. J Sports Sci 37: 2236-2242, 2019.
20. Sattler T, Sekulic D, Hadzic V, Uljevic O, and Dervisevic E. Vertical jumping tests in volleyball: Reliability, validity, and playing-position specifics. J Strength Cond Res 26: 1532-1538, 2012.
21. Scott T, Andrew S, Mathew OG, Matthew M, and Warren Y. The occurrence of different vertical jump types in basketball competition and their relationship with lower-body speed-strength qualities. Int J Strength Cond 1, 2021.
22. Smith S, Sikka R, and Bosch T. Analysis of the sport and sport positions, in: Strength training for basketball. J Gillett, B Burgos, eds., 2020, pp 13-26.
23. Sugiyama T, Kameda M, Kageyama M, Kiba K, Kanehisa H, and Maeda A. Asymmetry between the dominant and non-dominant legs in the kinematics of the lower extremities during a running single leg jump in collegiate basketball players. J Sports Sci Med 13: 951-957, 2014.
24. Tai W-H, Peng H-T, Song C-Y, Lin J-Z, Yu H-B, and Wang L-I. Dynamic characteristics of approach spike jump tasks in male volleyball players. Appl Sci, 11: 2710, 2021.
25. Teramoto M and Cross CL. Relative importance of performance factors in winning nba games in regular season versus playoffs. J Quant Anal Sport 6, 2010.
26. Teramoto M and Cross CL. Importance of team height to winning games in the national basketball association. Int J Sports Sci Coach 13: 559-568, 2018.
27. Teramoto M, Cross CL, Rieger RH, Maak TG, and Willick SE. Predictive validity of national basketball association draft combine on future performance. J Strength Cond Res 32: 396-408, 2018.
28. Zarić I, Kukić F, Jovićević N, Zarić M, Marković M, Toskić L, and Dopsaj M. Body height of elite basketball players: Do taller basketball teams rank better at the FIBA world cup? Int J Environ Res Public Health 17: 3141, 2020.