

ORIGINAL RESEARCH

KINEMATIC ANALYSIS OF KNEE VALGUS DURING DROP VERTICAL JUMP AND FORWARD STEP-UP IN YOUNG BASKETBALL PLAYERS

Gabriel Andrade Paz, MSc^{1,2}Marianna de Freitas Maia, MSc^{1,2}Déborah Farias, MSc¹Haroldo Santana, Masters' student^{1,2}Humberto Miranda, PhD¹Vicente Lima, MSc²Lee Herrington, PhD³

ABSTRACT

Purpose/Background: Lower limb asymmetry between dominant and nondominant limbs is often associated with injuries. However, there is a lack of evidence about frontal plane projection angle (FPPA) of the knee joint (knee valgus) during drop vertical jump (DVJ) and forward step-up tasks (FSUP) in young basketball players. Therefore, the purpose of this study was to assess the FPPA (i.e., dynamic knee valgus) via 2D video analysis during DVJ and FSUP tasks in the dominant and nondominant limbs of young male basketball players.

Methods: Twenty seven young male basketball players (age 14.5 ± 1.3 y, height 161.1 ± 4.1 cm, weight 64.2 ± 10.2 kg) participated in this study. The participants were asked to perform a bilateral DVJ and unilateral FSUP tasks. Kinematic analysis of FPPA was completed via a two-dimensional (2D) examination in order to evaluate the knee valgus alignment during the beginning of the concentric phase of each task. Knee valgus alignment was computed considering the angle between the line formed between the markers at the anterior superior iliac spine and middle of the tibiofemoral joint and the line formed from the markers on the middle of the tibiofemoral joint to the middle of the ankle mortise. Paired t-tests were used to evaluate differences in tasks. Standard error of measurement (SEM) was calculated to establish random error scores.

Results: There was no difference in knee valgus angle during the DVJ task between dominant ($20.2 \pm 4.4^\circ$) and nondominant legs ($20 \pm 4.1^\circ$; $p = 0.067$). However, a significant difference was noted during FSUP between the non-dominant limb ($18.7 \pm 3.4^\circ$) when compared to the dominant ($21.7 \pm 3.5^\circ$; $p = 0.001$) limb.

Conclusion: Two dimensional kinematic analysis of knee FPPA may help coaches and other professionals to detect asymmetries between dominant and nondominant limbs, and to develop training programs with the goal of reducing overall lower extremity injury risk.

Level of evidence: 2b

Keywords: Athlete development; injury prevention; knee; motor behavior; valgus moment

CORRESPONDING AUTHOR

Gabriel Andrade Paz

Universidade Federal do Rio de Janeiro

Avenida Carlos Chagas, 540 – Cidade

Universitária – Cep: 21941-590

Rio de Janeiro – RJ – Brasil.

Tel: 55-21-25626808; Fax: 55-21-25626808

E-mail: gabriel.andrade.paz@gmail.com

¹ School of Physical Education and Sports – Federal University of Rio de Janeiro, RJ, Brazil

² Biodynamic Laboratory of Exercise, Health, and Performance – Castelo Branco University, Rio de Janeiro, RJ, Brazil

³ Directorate of Sport, University of Salford, Salford, Greater Manchester, United Kingdom