

Original research papers

BIOMECHANICS OF THE AXEL PAULSEN FIGURE SKATING JUMP

ANNA MAZURKIEWICZ, DAGMARA IWAŃSKA, CZESŁAW URBANIK

Józef Piłsudski University of Physical Education in Warsaw, Faculty of Physical Education, Department of Anatomy and Biomechanics, Warsaw, Poland

Mailing address: Dagmara Iwańska, Józef Piłsudski University of Physical Education, Faculty of Physical Education, Department of Anatomy and Biomechanics, 34 Marymoncka Street, 00-968 Warsaw, tel.: +48 22 8342713, fax: +48 22 8651080, e-mail: dagmara.iwanska@awf.edu.pl

Abstract

Introduction. Figure skating is a sport discipline requiring a combination of artistic and athletic skills. The triple Axel Paulsen (Axel or A) jump is the most technically difficult jump of all figure skating jumps, which is why it is on the top of the International Skating Union (ISU) Judging System Code of Points (CoP). The purpose of this research was to explore the technical differences between the single Axel (1A), the double Axel (2A), and the triple Axel (3A) and to determine which parameters are the most important for performing the triple Axel successfully, using 3D kinematic analysis. **Material and methods.** In the study, one Polish elite male junior skater was tested. Following the usual warm-up, the skater performed a series of jumps on the ice, which were recorded. Six jumps of each type were recorded (6 x 1A, 6 x 2A, and 6 x 3A). Three jumps which were the best technically were chosen for further analysis. The APAS 2000 system automatically calculated the centre of gravity of the skater (CG) and generated the kinematic data of each jump. **Results.** The skater examined jumped higher when he was about to perform more rotations in the jump. The more rotations were to be made, the higher the jump was. Although the difference between the height of 2A and 3A was less than 10% and could not be considered significant, the height of 1A was significantly lower, by over 19%, than the height of the other two jumps. As also shown by previous research, the most substantial differences in the Axel jump technique were visible in the pre-take-off and take-off phases. **Conclusions.** We observed substantial differences in the movement technique and kinematic parameters of the pre-take-off phase in the triple Axel performance compared to the performance of the other two Axels. It can be assumed that decreasing the ankle joint angle in the pre-take-off phase was most essential in achieving rotations in the Axel jump. This substantial change in ankle flexion caused greater stress on the blade before the take-off, which resulted in a reduction of vertical velocity and enabled an increase in the vertical take-off angle.

Key words: figure skating, Axel Paulsen, biomechanics, jump kinematics, 3D analysis