A Pilot Study on Electromyographic Analysis of Single and Double Revolution Jumps in Figure Skating

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Abstract

The purpose of this study was to examine the muscle activation patterns during the take off and landing phases of single and double revolution jumps in figure skating. One professional male figure skater performed the following jumps: a single and double toe-loop and; a single and double flip. Using electromyography (EMG) the integrated rectified value (iEMG) was calculated for the following muscles of the take off and landing legs: gastrocnemius medialis, rectus femoris, biceps femoris and adductors. For the take off phase all values were clearly higher in the double revolution jumps for all muscles, while a similar pattern in the landing phase was observed for the adductors only. The activation of each muscle varied with the type of jump and the number of revolutions, suggesting that figure skaters might alter the muscles' EMG activity and, thus, the technique of the jump according to the number of revolutions required.

Keywords: EMG, muscle activation, rotations, skater

Introduction

Figure skating is one of the most complex and intense sports, with the vast amounts of movements made on the ice including among others spins, lifts and more importantly, jumps. Nowadays, competitive figure skaters of an international standard are able to complete up to four rotations within one jump. The successful performance of figure skating jumps is achieved with a combination of several factors, with vertical velocity at take off being one of the main factors identified in previous studies *(King, 2005)*. *King (2005)* stated that despite that vertical velocity at take off appears to be similar among different revolution jumps, when comparing skaters of different abilities, those with higher abilities generate greater vertical velocities at take off for the same type of jump. King suggested that the primary factor in generating vertical velocity is the powerful extension of the legs, implying that the contribution and activation of the lower extremity muscle groups plays a vital role in successful jump performance. Electromyography (EMG) can be a useful tool for the examination of the contribution of different muscle groups during figure skating jumps. However, muscle activation patterns of the lower extremities have not been studied in figure skating.

The execution of a figure skating routine during competition includes a combination of different jumps, with take off from both the dominant (DL) and non-dominant leg (NDL), and the number of rotations in the air varying from one to four. As one would expect, research has shown that the individual jump technique