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BIOMECHANICS OF BASIC SKI MOTION ON HILLS

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SUMMARY

This research conducted to investigate characteristics of ski movement during a basic ski movement in order to setup teaching guidelines for beginner skiers.

INTRODUCTION

Most previous ski studies have focused on high-level skiing techniques such as turning in alpine environments [1,2]. They used video analysis and usually had a time-consuming digitization process [1]. Thus, this study was designed to investigate ski movement during a basic ski run and stops (e.g. Pflug Fahren) on the hill using more quantitative analysis. Six certified ski instructors (age: 25.3 ± 1.5 yrs, height: 169.3 ± 2.9 cm weight: 66.2 ± 5.9 kg, career: 4.2 ± 2.9 yrs, boot size: 265 mm) participated in the test. Eleven high speed cameras (Qualiysis, Sweden) with a sampling of 100 Hz were used to capture ski motion on the hill (average temperature: -10° , average slope: $9-10^\circ$, Figure 1).



Figure 1: Experimental setup on hills using eleven infrared cameras and timing lights.

Subjects were asked to start from the top of the hill with a constant speed of 3.5 m/sec, controlled by the timing lights (Seed Tech, Korea), before passing the two different designated stop distances (e.g. 2 meter and 4 meter). Figure 2 shows the experimental conditions which were used in this test. In the kinematics of ski plate, changes in edge of ski (Rossignol, France) and absolute ski angle between the two different stops were analyzed using software (Mathlab, MathWorks).



Figure 2: Two different stop distances.

RESULTS AND DISCUSSION

There were the differences in peak ski plate angle (2m: $75.24 \pm 3.62^\circ$, 4m: $65.78 \pm 2.57^\circ$, $p=0.002$, Figure 3). Also, the differences in mean ski angle were observed (2m: $67.2 \pm 4.1^\circ$, 4m: $57.7 \pm 4.5^\circ$, $p=0.005$). On the other hand, there were the differences in peak ski edge angles (2m: $41.45 \pm 7.08^\circ$, 4m: $31.58 \pm 5.26^\circ$, $p=0.028$). Finally, the differences in mean edge angle were also found between two conditions angles (2m: $34.3 \pm 5.4^\circ$, 4m: $25.6 \pm 3.7^\circ$, $p=0.015$).

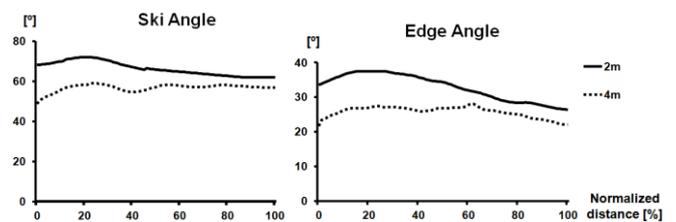


Figure 3: Comparison of angles between two stop distances.

CONCLUSIONS

These findings for basic ski motions should prove to be useful information when setting up teaching guidelines for beginner skiers. Further analysis of kinematics and the kinetics of the skier will be processed for more detail analysis.

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2. Müller E., Schwameder, H., J. Sports Sci., 21:679-692, 2003.