

EFFECT OF CHANGING TURN ANGLE AND RUNNING SPEED ON CUTTING MOVEMENT DURING SIDESTEP CUTTING

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INTRODUCTION: In many ball game sports such as soccer, players often change their direction of movement in the game. A sidestep or open-step cutting, in which the ongoing path proceeds away from the support leg side, is an effective way to retain to fast speed after changing direction (Ohtsuki et al., 1988). Changing direction during running requires appropriate adjustment of posture and movement. The purposes of this study were to investigate the effect of turn angle and running speed during sidestep cutting on the cutting movement, and to get a basic knowledge of the skillful motion.

METHOD: A complete Three-dimensional kinematic and force plate analysis was performed on nine amateur soccer players (year: 20.7 ± 0.8 years, height: 1.72 ± 0.04 m, body mass: 60.7 ± 3.9 kg) as they executed 4 sidestep cutting maneuvers with the right leg. Four sidestep cutting maneuvers consisted of combination of 2 running speeds (50% and 80% of possible; slow and fast) and 2 turn angles (45 deg and 60 deg). Subjects were required to run at maximum speed after changing direction. Based on information of speed curve of body center of mass (COM), cutting phase was divided into decelerating phase and accelerating phase during foot contact for cutting. Horizontal and frontal plane moment of ground reaction force (GRF) about COM during each sidestep cutting was calculated. Impulse of GRF in a direction of motion during each cutting was obtained. To determine the significant sidestep cutting maneuvers, we used one-way ANOVA procedures with repeated measures and Bonfferoni post-hoc test ($p < 0.05$).

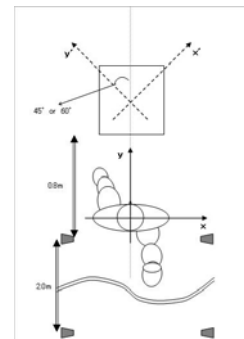


Figure 1: Subjects were indicated to keep running speed prior to sidestep cutting.

RESULTS and DISCUSSION: Impulse in a direction of motion during each trial is shown in Table 1. Braking impulse in fast speed-60° trials were significantly greater than in other trials ($p < 0.05$), and showed large deceleration in stance phase (post/pre speed rate 88%). In decelerating phase at each trial maximum frontal plane moment of GRF about COM was larger (viewed from the rear, counterclockwise) than during the accelerating phase. In fast speed trials, maximum frontal plane moment was not significantly different among four maneuvers. Maximum vertical GRF was not significantly different in decelerating phase at each trial. In fast speed trials, for accurate changing direction, runner acquired a large braking impulse, and additionally exerted large frontal plane moment of GRF about COM. This moment was not related to vertical GRF but to the moment arm to the COM. For quick and fast sidestep cutting, runner must have small braking impulse and appropriate frontal plane moment in cutting stance phase.

Table 1 impulse in a direction of motion for each trial

impulse	slow speed-	fast speed-	slow speed-	fast speed-
Braking (decelerating)	-0.28±0.10a	-0.39±0.11b	-0.39±0.11c	-0.77±0.13abc
Propulsion	0.70±0.19a	0.49±0.25b	0.91±0.20abc	0.45±0.23c

^{a,b,c} Denotes statistically significant difference ($p < 0.05$) during each step.

REFERENCES:

Ohtsuki, T, Yanase, M, and Aoki, K. (1988), *BiomechanicsXI-B*, 820-825.