EFFECT OF STANCE WIDTH ON KINEMATICS OF LABORATORY LANDINGS WITH FIXED FEET ON A KITEBOARD

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Introduction
Board sports, such as kitesurfing and wakeboarding, involve landings with the feet attached to a board. The athlete has the possibility to slightly adjust the stance width on the board, however, few studies have observed the kinematic effects of using different stance widths. On-water landing task, require the athlete to rapidly attenuate force on an unstable surface, making this activity a high-risk task for injury [1]. This study aimed to observe the effects of three stance widths on kinematics of the knee and ankle joints.

Methods
Twelve male subjects, (mean ± SD; age 26.3 ± 3.5 years; stature 1.82 ± 0.62 m; and mass 78.6 ± 7.0 kg), who had 5.2 ± 1.8 years of experience of kitesurfing. They performed landing tasks by jumping down from a 0.36 m box, turning the board 90° front side and landing sideways on a force plate. The landing tasks were observed using an optoelectronic system with 16 cameras (Qualisys Oqus 3) running at 400 Hz and a force plate (Kistler Instrumente AG, Winterthur, Switzerland) of 0.60 x 0.90 m recording at 800 Hz. All trials were also video recorded. Reflective skin markers were placed bilaterally on the shoulders, anterior superior iliac spines, iliac crests, greater trochanters, superior of patella, tibial tuberositas, calcaneus, femoral epicondyles, as well as lateral and medial knee joint lines and malleoli, and one marker on sacrum. Clusters of four markers were mounted onto rigid plates, which were strapped laterally onto the thighs and shanks. Segments were modeled in Visual 3D. The placement of feet insertion used three different stance widths; narrow (0.54 m between the midpoint of the pad), medium (0.58 m) and wide (0.62 m). Data of joint angles (ankle dorsiflexion, knee flexion, knee abduction and tibial rotation) were calculated using Visual 3D, and compared between the three stance widths using ANOVA with a post-hoc Sidak adjustment and significance level of 0.05, using SPSS version 20.

Results
No significant changes were observed in knee flexion, or abduction movement between the three stance widths. However, the back foot tibial internal rotation at peak force increased at the narrow stance (p<0.05), and so did the maximal dorsiflexion (p<0.05). The peak force measurement had low reliability (ICC<0.3) and did not show any differences between the stance widths.

Discussion
Although the changes were small for different stance widths, two variables showed significant change. The increased maximum ankle dorsiflexion at the narrow stance width may suggest that athletes with limited range of motion in the ankle joint should be advised to use slightly wider stance width. Furthermore, a larger internal rotation of the tibia may suggest increased strain on the anterior cruciate ligament [2], and is therefore recommended to study further in regards to injury risk.

References

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