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The purpose of this study was to measure alpine ski turning technique during slalom race simulations and compare ski turning technique while wearing the Opedix Knee Tec tights (OPX) or a standard compression garment (CMP). A three-dimensional inertial based method utilizing inertial measurement units (IMUs), a global positioning system (GPS) and a pair of foot pressure insoles was implemented to capture the slalom performance of 9 highly skilled athletes (4 men, 5 women) on a course with 13 m linear gate distances offset by 3 m. The skier's movements, ski loading characteristics, ski orientation, speed and the electromyographic (EMG) activation of select knee muscles of the right downhill leg were measured during the performance of 9 consecutive left turns while skiing with OPX and CMP tights. The performance order of the two conditions was balanced across participants.

Skier's Movements. Minimum, maximum and average sagittal plane hip, knee and ankle motions were measured and compared between OPX and CMP conditions. The minimum ankle position was 7% less flexed at the initiation of the turn for the OPX condition. No statistical differences were found between conditions for the knee variables. The maximum and average hip angles were 5% and 3% more flexed forward during the OPX condition.

Ski Loading. Maximum ground reaction force, and minimum, maximum and average anterior/posterior and medial/lateral force application points were compared between OPX and CMP conditions. The peak ground reaction force was 9% lower (≈27 lbs of force) during the OPX condition. The maximum and average anterior-posterior force application point was 2% and 3% more anterior (≈3 and 4 mm forward, respectively) for the OPX condition. The minimum medial-lateral force application point, occurring at the initiation of the turn was 9% more medial (≈2 mm towards the inside edge) for the OPX condition.

Ski Orientation. The minimum, maximum and average edge angle was measured and compared between OPX and COM conditions. The edge angle at the initiation of the turn was 13% greater (≈10 deg) for the OPX condition.

Knee Muscle Function. The peak knee extensor torque and the average EMG activation of two quadriceps muscles (rectus femoris, RF; vastus lateralis, VL) and a hamstring muscle (biceps femoris; BF) were compared between OPX and CMP conditions. The peak knee torque was 16% lower for the OPX condition. The RF and VL EMG activations were each 17% lower and BF was 4% higher during the OPX condition.

Performance. Average right turn speed and turn duration were compared between OPX and CMP conditions. Although these variables were statistically equal, average turn speed was .3 mph slower (OPX 20.7 mph; CMP 21.0 mph) but average turn duration took .044 s less time for the OPX condition (OPX 8.314 s; CMP 8.358 s).

A different ski turning technique was demonstrated with the OPX tights. Greater hip flexion at the initiation of the turn moved the force application point forward and towards the inside edge of the ski resulting in a greater edge angle (ie., carving). Greater carving at initiation reduced the ground reaction force during the steering phase of the turn and when combined with greater hip flexion reduced the muscular effort from the quadriceps muscles to steer the skis. This modified ski turning technique with the OPX tights ultimately resulted in a reduced amount of time to complete the turn presumably due to a shorter turn length. Collectively, these results may have implications for alpine skiing safety, performance and training.