CO21-003-e

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Introduction.– The operational capacity of a nuclear submarine is closely linked to the performance of his crew, especially physical capacities. The constraint environment in submarine (reduced living space and sports equipments, special rhythm of work, lack of natural light, stressful environment) and limited participation could lead to a state of deconditioning in effort after deployment.

Methods.– Thirty-four submariners (aged 26.6 ± 4.3 years, watch schedule, practising aerobic sports 80%) underwent a triangular type cardio respiratory test with an electromagnetic cycle ergometer, an assessment of muscles strength (quadriiceps and hamstring) with an isokinetic dynamometer at 60°/s and 180°/s and anthropometric measurements, before and after a patrol period of two months (65 ± 2.68 days).

Results.– The aerobic capacity at maximal exercise, after deployment, significantly decreased of 3% (P = 0.03), with VO2max before patrol at 46.4 ± 6.5 mL/kg/min and after at 44.9 ± 5.7 mL/kg/min. There was no significant difference in heart rate at maximal effort, maximal aerobic power or sub-maximal VO2 at 200 W. Regarding muscular parameters, isokinetic fatigue index at 180°/s was significantly increased of 11% (1.8 ± 0.6 vs 2 ± 0.6 J/s, P = 0.05) for quadriiceps as well as for hamstrings of 8% (1.2 ± 0.8 vs 1.3 ± 0.3 J/s, P = 0.05). No significant difference for explosive strength was found for quadriiceps/hamstrings peaks torques at 60°/s.

Conclusion.– This study shows that submariners have impaired cardio-respiratory performances, accompanied by increased peripheral muscular fatigability after two-months submarine deployment.

Further reading


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Keywords: Injury; Prevention; Medial arch; Foot; Ankle

CO21-004-e

Influence of fatigue on running biomechanics in adolescent athletes

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Keywords: Injury; Prevention; Medial arch; Foot; Ankle

Introduction.– Foot/ankle muscles fatigue which results in alterations of running biomechanics and plantar pressure distribution may lead to an increased injury risk [1].

Methods.– Effects of fatigue were measured in 11 young athletes during a time to exhaustion running bout on treadmill at 95% of the maximal aerobic speed [1]. Tested parameters were resistance to fatigue (isokinetic) in ankle plantar and dorsi- flexors, stride frequency and length, vertical stiffness, leg stiffness and vertical ground reaction force, as well as foot plantar pressure distribution (embedded insoles with sensors).

Results.– Resistance to fatigue was significantly reduced in ankle plantar flexors in fatigued state (fatigue index dropping from ~23.8% in pre to ~30.5% in post, P < 0.05), but not in dorsi- flexors (from ~27.6% to ~32.0%, P > 0.05). Leg stiffness decreased (~7.4%, P < 0.01) and vertical ground reaction force increased (+22.5%, P < 0.05) in fatigued state, whereas other parameters remained unchanged.

Contact area and relative load under the foot medial arch increased significantly in fatigued state (+9.6% and +4.6%, P < 0.01).

Discussion.– The decrease of the triceps resistance to fatigue may induce an imbalance between ankle plantar and dorsi-flexors, affecting the protective action of these muscles and increasing potentially the risk of overuse injuries.

Fatigue-related biomechanical adaptations of young athletes appeared very specific and favoured vertical force production during the stance phase, in opposition to adults who tended to decrease stride frequency and vertical force in order to protect their lower limbs' musculoskeletal structures [1]. Foot medial arch seems to be a key structure during the load absorption process in fatigued state. This may justify the preventive strengthening of the intrinsic and extrinsic muscles supporting the medial arch, using for instance barefoot running or electrostimulation [1].

Reference


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Seasonal variation in vitamin D status in professional soccer players of French second League

Keywords: Isokinetic; Knee; Rugby; Evaluation

Introduction.– Isokinetic testing of the knee is very helpful to prevent leg muscular injuries and knee injuries. To analyse the results of the tests we need references values specific to the rugby players. Since these data were not available in the litterature, the Fédération Française de Rugby and the Ligue Nationale du Rugby decided to assess these isokinetics parameters in french Professional rugby players.

Materials and methods.– Multicentric observational study including eight professionals clubs with measure of isokinetic knee strength for 250 players.

Protocol testing was two concentric sets for quadriiceps and hamstrings at the speed of 60°/s and 240°/s and one eccentric test at 30°/s only, for the hamstrings.

Results.– Concentric strength at 60°/s: quadriiceps strength is 2.4 N.m/kg for the first row, 2.5 N.m/kg for the second and third row and 2.7 N.m/kg for the halves and backs. For the hamstring the strength is 1.4 N.m/kg for the first row, 1.6 N.m/kg for the second and third row and 1.7 N.m/kg for the halves and backs. Concentric strength at 240°/s: quadriiceps strength is 1.6 N.m/kg for the first row, 1.8 N.m/kg for second and third row and 1.9 N.m/kg for the halves and backs. For the hamstring the strength is 1.2 N.m/kg for the first row, 1.3 N.m/kg for the second, the third row and the halves and backs. Eccentric strength at 30°/s: for the hamstring the strength is 1.9 N.m/kg for the first row, 2.0 N.m/kg for the second and third row and 2.1 N.m/kg for the halves and backs.

Discussion.– We found some differences between players, according to their playing position, mainly due anthropometric differences (weight). These results will be very useful to interpret properly the isokinetics test of the knee for the rugby players, according to their playing position.

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