Isokinetics and Exercise Science 13 (2005) 25–26
IOS Press

Abstract

Isokinetic and functional muscle performances among football players: A transversal study

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Athletic physical conditioning demands an ever increasing scientific approach. Isokinetics allows us to objectively quantify muscular strength. However such an evaluation remains analytical and only provides us with partial information about the athlete's functional skills. The opto-jump system assesses the strength-speed factor in different ways (dash running and jumps), therefore allowing a functional analysis of the muscle performance. The goal of this study dealing with football players was the transverse analysis of the functional and isokinetical variables in different age groups and the correlation analysis between analytical and functional variables.

57 football players, fit for intense sport practice, were included into 3 subsets: pro-group (PG: 22-years-old or older; n =20), minor leaguers (ML: 18 to 21-years-old; n =20), juniors group (JG: 15 to 17-years-old; n =17). The isokinetical strength of the knee's flexor-extensor muscles was measured in concentric mode (60 and 240°/s) as well as eccentric (30 and 120°/s). Field tests were also achieved: 10-meter dash running and squat-jump series. These tests were performed by use of an optical measuring system that measures flight and ground contact times (opto-jump). A one criterion variant analysis, combined with the Bonferroni test, enabled us to compare the performances and correlative studies were carried out.

Focusing on the absolute performance of the quadriceps strength at low speed, our results showed significant differences ($p < 0.05$) between ML and JG. This difference also exists between PG and JG (non-significant). At high speed, the absolute value of the quadriceps strength also showed significant differences between PG and JG as well as differences between ML and JG. The same statistical differences between PG-JG and ML-JG were reported for the squat-jump data.

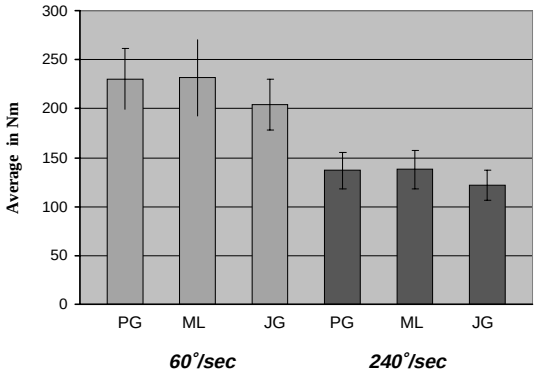
In the pro-group, the squat-jump appeared significantly correlated with extensor peak torques at 60°/s ($p < 0.001$ and $r = 0.64$) and at 240°/s ($p < 0.0001$ and $r = 0.63$). The 10-meter dash running was not linked to any isokinetic variables of the 3 player groups.

The maturation of the muscle system and intense weight lifting sessions have most likely contributed to the significant differences between the 3 tested groups. Intensive body-building surely affects the squat-jump results in all groups. The absence of correlation between dash running and isokinetical variables could be explained by the not strength-related factors such as reaction time, ground contact duration, gesture frequency.

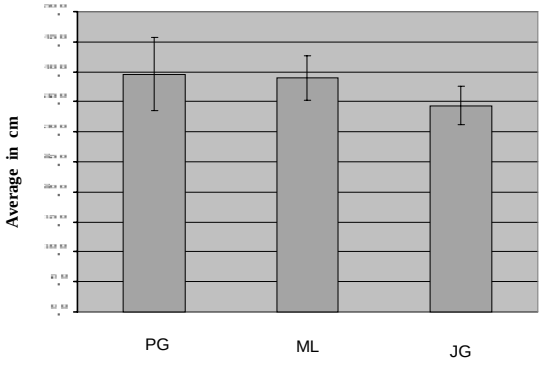
Conversly to the 10-meter dash running test, the squat-jump and the isokinetic assessment of the football player appear to be discriminating tests towards the age feature.

ISSN 0959-3020/05/$17.00

Quadriceps strength comparison at 60 and 240˚/s in all groups



Squat Jump



Despite the close relationship between some of their parameters, isokinetic and opto-jump can be complementary measurement tools: the opto-jump system allows a thorough functional evaluation of the lower limbs muscle performances and the isokinetic evaluation permits to assess analytical strengh of each muscle group. For instance, if the field test results do not match with normal values, isokinetical evaluation could identify a muscle group deficiency. By contrast, if the isokinetical values stand normal, a neuromuscular coordination deficiency would be evoked.