

NEW TRENDS IN ASSESSMENT AND CONTROL OF TRAINING

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Testing and functional assessment seem to be an adequate tool for descriptive purposes in research-oriented physiological and biomechanical studies, in establishment of normative profiles or in determining physical conditions in different sportive specialities. Nevertheless one of the main purposes of testing is evaluation and control of training programs and athletes and prediction of competition results. From this last point of view coaches and researchers find important limitations. Despite this fact a periodical evaluation of athlete states in different moments of the season is a very common practice in elite sport.

The main limiting factor of testing is its lower predictive value. For this reason coaches and athletes use to ignore their results, even when they are often carefully planned and administrated.

In its turn, researchers are mainly involved in improving validity, reliability, and objectivity of the tests and try to give plausible explanations to the lack of predictability value. As a result an enormous effort is focused on the sophistication of technology of testing with high money and human investments in order to improve the testing methods.

Conventional testing and assessment are highly influenced by classical science, based on a linear cause-effect relationship. Most of their problems and limitations can be understood considering the perspective of the traditional model of science.

Recent applications of theories based on the complexity of

non-linear systems to movement sciences can help to find an alternative explanation to some of the more usual problems stated by testing and its low predictive value.

The concept of self-organisation, the interpretation of errors as fluctuations necessary for the evolution of the system and the individuality of responses are some of the principles that can explain some of the common problems found in testing and transform the concept of assessment.

The individual is recognised as a basic unit of analysis, and its response to effort is considered as being variable, even if we are talking about highly trained individuals. The acceptance of the unpredictable nature of the responses decreases the prognosis value of testing and its focus on the quantitative aspects. Instead, there is a claim for getting qualitative information about interaction between non-linear variables and the explanation of the processes involved in the improvement of performance.

Alternative modelling techniques, applying computer based concepts, are recently developed as tools able to evaluate continuous learning and adaptation processes in sport. Applications, as alternative methods for assessment and training control, and main contributions, as the optimisation of training load and comprehension of performance development processes, will be discussed.

Key words: assessment, training, non-linear systems, computer-based modelling

CHANGES IN EXPLOSIVE FORCE PRODUCTION MEASURED BY THE BOSCO PROTOCOL DURING STRENGTH TRAINING BASED IN WEIGHT LOAD AND LIGHT LOAD DURING THE SET (CONTRAST METHOD) IN PEOPLE OF 50 TO 70 YEARS

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Actually, the population of 50 to 70 years old is a growing one in most of industrialized countries. Older people suppose a social group of quantitative and qualitative importance. This way, the progressive elderly has happened in the last decades and it constitutes one of the main questions that the society will confront in next years. It has been demonstrated that the decrease in the force production is associated with the inability to carry out certain activities of daily life. For example, it is necessary the inferior member's unilateral power of the extending one of at least 3 W. Kg. -1 of corporal weight to go

up stairways without help, for that that people with an unilateral power of less than 2 W. Kg. -1 cannot go up stairways unless they make it very slowly and with help. The well documented losses of muscular strength and muscle mass with age known as sarcopenia because they are associated with an increased susceptibility to disability among the elderl, an increased risk of falls, and hip fractures. Strength training is considered a promising intervention for reserving the loss of muscle function and the deterioration of muscle structure that is associated with advanced age. Strength

training in the elderly: is an effective intervention against the sarcopenia because it produces substantial increases in the strength, mass, power and quality of skeletal muscle.

Twenty-two volunteered healthy man and woman 50 to 70 years old were divided into two groups with different physical activity levels (not athletes n=9, athletes=12), to a strength training. The total duration of the present study was 16 weeks. The subjects trained 3times per week on non-consecutive days. The strength training consisted in 6 exercises with light loads that oscillated between the 40 and 50% of 1 maximum repetition (1RM), and with heavy loads that oscillated between the 65 and 80% of 1 RM. The strength training based in weight load and light load were during the set. The subjects were carefully familiarized with the testing procedures of explosive force production, elastic-explosive force production, and it reactive-elastic-explosive force production. Force

production was measured before and after strength training using a platform of pressure (License of FCCAFD, University of Granada).

RESULTS

The results showed that the training produces highly significant improvements ($p < 0,001$) in the maximum height of Squat Jump (SJ), Countermovement Jump (CMJ), and in the Drop Jump (DJ) in not athletes group. In athletes group highly significant improvements were shown in the SJ and CMJ, and significantly in the DJ ($p < 0,05$). The present results show that strength training based in weight load and light load during the set leads to increases the maximum height of Squat Jump (SJ), Countermovement Jump (CMJ), and in the Drop Jump (DJ).

CHANGES IN MUSCLE MASS AND MUSCLE CROSS SECTIONAL AREA (CSA) AFTER A STRENGTH TRAINING BASED IN WEIGHT LOAD AND LIGHT LOAD DURING THE SET (CONTRAST METHOD), IN SUBJECTS OF 50 TO 70-YR-OLD

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The population of elderly adults in western societies is a growing one. Mean life expectancy has increased dramatically during the twentieth century. Ageing is associated with a reduction in muscle mass, which in turn has been implicated as a primary, causative factor in the reduction of muscular strength with age. Age-related causes a mal-functioning of all the human systems, among them the muscular one. This decrease of muscle strength causes a loss of quality of life and functional dependence. It takes us to think that a correctly planned strength training would help to older people to improve its living diary activities. The strength training has been shown to be a safe and effective intervention for increasing strength, cross-sectional area (CSA) and improving functional ability in the elderly. It supposes a gain of functional independence, and a better quality of life, so as reduction in mobility problems may lead to falls, injuries, fractures, muscle-skeletal injuries, often leads to institutionalisation. The strength-training of high intensity leads to an increment in protein synthesis, it causes a phenomenon of muscular hypertrophy therefore. Likewise, a relationship ageing-loss of muscular mass, and decrease of the cross-sectional area exists (CSA).

Twenty-two volunteered healthy man and woman 50 to 70 years old were divided into two groups with different physical activity levels (not athletes n=9, athletes=12), to a strength training. The total duration of the present study was 16 weeks.

The subjects trained 3times per week on non-consecutive days. The strength training consisted in 6 exercises with light loads that oscillated between the 40 and 50% of 1 maximum repetition (1RM), and with heavy loads that oscillated between the 65 and 80% of 1 RM. The strength training based in weight load and light load were during the set. The muscular mass was measured by means of anthropometry and certain through two equations: of Martin and Doupe. The thigh CSA was determined through the equation from Housh et al. and that of the arm CSA through the equation of Heymsfield et al.

RESULTS

The results showed that the strength training increased significantly ($p < 0,001$) on the muscular mass in the not athletes group and in the athletes group. After training, CSA increased significantly ($p < 0,05$) in the thigh and very significantly ($p < 0,01$) in the arm in the not athletes group. In the athletes group increased in a highly significantly way ($p < 0,001$) both CSA.

As conclusion we can affirm that the strength training based in weight load and light load during the set causes increases of muscle mass and CSA muscle in man and woman 50 to 70 years with different physical activity levels.

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EFFECT OF PLYOMETRIC TRAINING ON VERTICAL JUMP IN MALE HANDBALL PLAYERS

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The purpose of the study was to investigate the effect of an 8-week plyometric training (PT) programme on the vertical jump (VJ) of Maltese male national handball players.

MATERIAL AND METHODS

Fourteen male handball players, were randomly allocated into two groups, the experimental group (n=8) further subdivided into 2, half training once weekly (E1=4) and the other half training twice weekly (E2=4), and the control group (n=6) who did not participate in the programme, with all participating athletes continuing with handball training. Subjects chosen were not involved in PT at the time of the study, had a basic stabilization strength level, with no potential medical problems or history of ankle, knee or back pathology within the previous three months. The VJ height was recorded in 4 jumping techniques together with standard physiological

and anthropometric measurements before and after the initiation of the programme.

RESULTS

The E2 group statistically improved in the VJ jump of 2 jumping techniques, the counter-movement jump (CMJ) and multiple hop test (MHT), with minimal increments in the arm-swing jump (ASJ). The E1 and control group showed regression or minimal changes in all tests.

CONCLUSION

Taking into account the small number of subjects, there is still a clear indication that regular PT will improve VJ in handball players.

DEVELOPMENT OF A CAPTURE AND INTERPRETATION OF DATA SYSTEM APPLIED TO THE SPORTSMAN'S FUNCTIONAL VALUATION

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PURPOSE

To elaborate a computer system of high precision (hardware and software) to value the qualities of force, speed and resistance through field test in sportsmen.

MATERIALS AND METHODS

For the elaboration of the hardware the following materials were used: Photoelectric cells, infrared sensors, exponential speaker, amplifier of tension for the sensors, multiple cable of transmission of signs of the cells, sign conditioner and feeding source, data acquisition card, compatible computer PC. The software was elaborated in language C developing the programs: Valsport speed, valsport resistance, valsport long jump and valsport resistance.

For the mensuration of times the timers incorporated by the PCard that are independent of the personal computer were programmed. These are used to create a stable pattern of times, controlled by quartz that has been programmed to generate a frequency with a period of 1 milisecond. The validation was carried out in the laboratory using the following equipment: Digital oscilloscope PROMAX OD-460, with probes S-10P (PROMAX). Oscilloscope HAMEG HM 604,

with probes HAMEG HZ-51. Frecuencymetrer/Counter PROMAX FD-250. The acquired times were also compared with other systems applied to the sportsman's functional valuation: Newtest (Hakinen and cols. Finland) and Muscledab Ergotest Tecnology a. s. (Bosco, C. and cols. Langesund, Norway), for they was incorporated two photoelectric cells to the three teams taking 100 times.

RESULTS

The oscilloscopes showed a stable frequency of 1 KHz (1000 impulses per second). With regard to the comparison with other systems applied to the sportsman's functional valuation, correlations of 0,996 and 0,994 were obtained ($p < 0,001$) for the Newtest and Muscledab Ergotest Tecnology respectively.

CONCLUSIONS

The valsport 2.0 system is a precise and reliable system for the sportsman's functional valuation. The different programs allow to create protocols personalized to value the speed, explosive force and resistance in sportsmen.

Key Words: Functional valuation, Personal computer, PCard, sensors.

EVOLUTION OF ACCELERATION CAPACITY IN FOOTBALLERS ALONG THE SEASON

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PURPOSE

To analyse the footballers capacity to carry out maximum speed running and to establish the evolution along the season.

To compare the results with previous studies carried out in footballers and other sportsmen.

MATERIALS AND METHODS:

20 footballers of Second B Division was valued to the end of the pre-season and in the middle of competitive period. The technological application Valsport V.2.0 was used, incorporating 11 photoelectric cells that provided 10 intermediate times accurately of 0,001 second. The first test was carried out on 50 meters (cells each 5 meters) and the second on 30 meters (cells each 3 meters).

RESULTS

The average time above 50 meters was $6,728 \pm 0,20$ sec. (average speed $7,44 \pm 0,23$ m/s). The maximum speed was of $8,68 \pm 0,43$ m/s.

In the second test above 30 meters the average time was $4,311 \pm 0,12$ seconds (average speed $6,96 \pm 0,19$ m/s). The maximum speed was $8,39 \pm 0,31$ m/s.

In the second test the time was 0,086 sec. better to the 15 meters and 0,074 seconds to the 30 meters.

CONCLUSIONS

The footballers have a high capacity of acceleration in short distances (1 to 15 meters), improving this capacity along the season.

They obtain 98% of their maximum running speed above 25 - 30 meters.

The acceleration capacity in professional footballers is higher in comparison with the amateurs.

Key Words: Soccer, functional Valuation, speed, acceleration capacity, maximum speed.

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